

BRITISH
FLOWERING
PLANTS



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BRITISH
FLOWERING PLANTS

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LONDON AND WATFORD

BRITISH FLOWERING PLANTS

ILLUSTRATED BY THREE HUNDRED
FULL-PAGE COLOURED PLATES
REPRODUCED FROM DRAWINGS BY

MRS. HENRY PERRIN

WITH DETAILED DESCRIPTIVE NOTES
AND AN INTRODUCTION BY

PROFESSOR BOULGER, F.L.S.

VOL. IV

LONDON

BERNARD QUARITCH

11 GRAFTON STREET, NEW BOND STREET, W.

1914

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CCXXIV.—THE SMALL BINDWEED.

Convolvulus arvensis Linné.

THE Order *Tubifloræ* is a large one, comprising twenty Families, nine of which are represented in the British flora. They agree in having a gamopetalous corolla, a single whorl of epipetalous stamens, and two, or more rarely five, carpels united into a superior ovary. The flower may be polysymmetric or monosymmetric; but in the first three British Families which are associated by Engler and Prantl, the *Convolvulaceæ*, *Polemoniaceæ*, and *Boraginaceæ*, it is polysymmetric.

The Family *Convolvulaceæ* includes about a thousand species in about forty genera. They are mostly annual or perennial herbs, with milky juice, and scattered, stalked but exstipulate leaves. The juice in some cases, such as those of the Mexican Jalap (*Ipomœa Purga* Hayne) and the Levantine Scammony (*Convolvulus Scammonia* Linné), is purgative; but in others there are edible tuberous roots, as in *Ipomœa Batatas* Lamarck, the Sweet Potato, a native of Brazil, several varieties of which are cultivated in warm countries. Many representatives of the Family are twining plants; but the Dodders (*Cuscuta*) are the only genus which have become leafless parasites.

The flower is usually large and may be of almost any colour, sometimes, as in the favourite garden annual, *Convolvulus tricolor* Linné, a native of the western Mediterranean region, combining true blues and yellows in the same flower. The colours are often very brilliant and are accompanied by the secretion of honey, generally concealed, and sometimes also by perfume. Thus the trumpet-shaped and often deep blossoms are adapted to the visits of humming-birds in Tropical America, and to those of hawk-moths and other long-tongued insects elsewhere; and it is, of course, for these beautiful flowers that many members of the Family are valued in our gardens. The parts of the flower are mostly in fives, the sepals being usually distinct, imbricate in the bud, with the odd one at the back of the flower, and persistent; while the corolla is hypogynous and convolutely plaited. The honey is secreted by a fleshy ring-shaped hypogynous disk; and the ovary consists of two united carpels, forming a two-chambered ovary with central placentation and two, or rarely four, ovules in each chamber. The filaments of the stamens are often unequal in length and so dilated at their bases as to cover in the honey, so that the pollinating insect has to force them apart; and the anthers are arrowhead-shaped and basifixed. The style is usually bifurcate and the fruit a capsule.

While the Family is largely Tropical, the genus *Convolvulus* belongs mainly to Temperate regions. It comprises some 170 species, and is distinguished from the larger genus *Ipomœa* by having two filiform stigmatic branches to the style instead of the knob-like, or *capitate*, two- to three-lobed stigma of the latter. *Ipomœa*, which comprises over 400 species, including the Morning Glory (*Ipomœa purpurea* Roth),



THE SMALL BINDWEED—continued.

the Sweet Potato, and the Jalap, belongs mainly to the Tropics and Warmer Temperate Zones.

The name *Convolvulus* was used by Pliny for the Great Bindweed (*C. sepium* Linné) of our hedgerows, which some botanists separate, on account of the two large leafy bracts below the flower, under the name *Calystegia*. As Philemon Holland's quaint translation renders the old encyclopædist, who has been speaking of the White Lily :—

“There is an herb named in Latine Convolvulus (*i.e.* with wind), growing among shrubs and bushes, which carrieth a flower not unlike to this Lilly, save that it yeeldeth no smell nor hath those chives within ; for whitenesse they resemble one another very much, as if Nature in making this floure were a-learning and trying her skill how to frame the Lilly indeed.”

The name *Wiihwinde*, apparently a literal translation of *Convolvulus*, occurs in Ælfric's tenth-century Vocabulary ; and Turner is, perhaps, referring to both our common inland species when, in his “*Libellus*” (1538), he writes :—

“Conuolnulus, dioscoridæ clematis, altera, est aliquibus liliastrum, anglis autem The comon bynde, aut The lytell wynde. Hec est illa herba que improbo cauliculorum suorum reptatu, proximas quasque herbas & frutices humiliores irretit.”

“Convolvulus, the second Clematis of Dioscorides, is the Liliastrum of others and the Common Bind or the Little Wind of the English. This is the herb that with the wicked grasp of its little stems enmeshes whatever herbs or low-growing shrubs are near by.”

The growing shoot circumnutates counter-clockwise, making a revolution in about two hours ; and, as *Convolvulus arvensis* Linné specially rejoices in warm light soils, whether calcareous, gravelly, or sandy, it was as the strangler of the barley that it acquired the name of *Bearbind*, though it is also sometimes known as *Wheatwind*. Beautiful as it is, it is, indeed, as Sir Joseph Hooker describes it, “a pest to agriculture,” its slender rhizome penetrating to a considerable depth and ramifying extensively underground.

The flowers are in axillary cymes, from one to four flowers in each, but with us generally two. It is remarkable that the species, which, though a native of the North Temperate region of the Old World, has become naturalised in Australia, Tasmania, and South Africa, in those southern regions bears only single flowers in each axil. The delicate corollas unfold about seven o'clock in the morning and close about ten at night or in bad weather. Their colour varies from pure white to a deep rose, and they have generally five deeper-tinted bands, each widening from a point downwards and occupying just that portion of the surface which was outside when the corolla was rolled up in the bud. It has been suggested, therefore, that this deepening of the tint, which occurs often in allied species, may be directly due to the sun's rays. The flowers, which, as is the rule in the genus, seldom expand for more than one day, exhale a fragrance, as delicate as their colouring, which has been variously compared to Heliotrope and to Bitter Almonds. They are protandrous, and, being freely visited by insects, are, no doubt, often cross-pollinated ; but the insect-visitors are often seized by a fierce spider which haunts the blossoms.

CCXXV.—THE SEA BINDWEED.

Convolvulus Soldanella Linné.

BELOVED as are the blushing bells of *Convolvulus arvensis* by children, it is not surprising that the farmer speaks of the plant in less endearing terms.

"Among the ripe corn," writes Mr. Hudson, in his "Nature in Downland," "along the ragged fringes of the field, and close to the dusty path, the bindweed, adorned with its delicate rose-coloured blossoms, runs riot; and twining in and out among the dry, bright stalks, its green, string-like wandering stem has something of the appearance of an exceedingly attenuated tree-snake. Why is it that this most graceful weed, seen in the wheat, invariably gives me the idea of a sentient being delighting in its own mischievous life? It is the pretty spoilt darling of the fields who has run away to hide in the corn, and to peer back, with a roguish smile on its face, at every passer-by. Perhaps the farmer is partly to blame for the fancy, for the bindweed vexes his soul, as it will vex and hinder the reapers by and by; and he abuses it just as if it had a moral sense and ears to hear, and ought to be ashamed of itself. It pleased me to be told by a village maiden that not bindweed nor convolvulus, but *lilybind* was the true name of this pretty plant."

But if the farmer has nothing but abuse for *C. arvensis*, he has no reason to find fault with either of the two British species which Robert Brown placed in his genus *Calystegia*, so named apparently from the Greek κάλυξ, *kalux*, the calyx, and στέγη, *stegē*, a roof. The Great Bindweed (*Convolvulus sepium* Linné), though a mischievous weed in gardens, where its massive underground growth starves any neighbouring plants while its aerial stems strangle them, occurs chiefly in hedgerows and by the banks of streams where it can do but little harm to any crop. Its beautiful large white, or occasionally pink, trumpets close at dusk, to open again by moonlight, and seldom set seed unless pollinated by the large *Convolvulus* Hawk-moth which may sometimes be seen hovering over them, or inserting its very long proboscis into the fragrant white tubes of *Nicotiana alata* Link and Otto quite late at night. The caterpillar of this moth, protectively green-coloured, feeds upon all our three British species.

The Sea Bindweed (*Convolvulus Soldanella* Linné), widely distributed on sandy shores not only in the Temperate regions of the Northern Hemisphere, but also in the Southern, binds together with its long, slender rhizomes the shifting sands of the dunes alike on our own coasts and in those of New Zealand, much as does its relative *Ipomœa biloba* Förskal, often known as *I. pes-capræ* in the Tropics. Its glabrous, succulent, kidney-shaped leaves, which sometimes rise on their long stalks in thick patches of dark green alongside the Stork's-bill, Rest-harrow, Burnet Rose, Comfrey, Ragwort, Yellow Bedstraw, and Pimpernel of our fixed dunes, have been very naturally compared to those of the Batrachian *Ranunculi* and of *Hydrocotyle*. Turner, after quoting the English name Folefote (Foal-foot) for *Asarum*, the larger leaves of which are of a similar form, says of this plant :—

"*Brassica marina* is called in greeke krambe thalassia, in duche meer kole, in french soldana. I haue not sene it in Englande, but I thynke that it groweth plentuously in Englande. It may be called in english seafolfote, it groweth plentuously in east Friesland, about the bankes of ditches, whereinto the salt water cometh at euery sprynge tyde, it groweth also much in middowes by the sea syde, whiche are somtyme ouerflowed with the salte water."

In his "Herball," however, of 1551, he says :—

"I haue not sene it in Englande savyng only besyde Porbeck."



THE SEA BINDWEED—continued.

Dodoens called the plant *Soldanella*, that name, and *Soldana* of which it is a diminutive, being probably derived from the Italian *soldo*, the Latin *solidus*, the name of a coin the initial letter of which is familiar to us in £. s. d., in reference, of course, to the rounded leaves. Lyte and Gerard reproduce this name and translate *Brassica marina* as *Sea Cawle* and *Sea Cole* ; but Gerard criticises those who have so called the plant :—

“What reason hath mooued them so to do,” he says, “I cannot conceiue ; . . . of this I am sure, that this plant and *Brassica* are no more alike then things which are most unlike.”

He also adds that it is called *Scottish Scurvy-grass* because it was used instead of the true Scurvy-grass (*Cochlearia*) in Scotland. Johnson, in his edition of Gerard (1633), adds :—

“My friend Mr. Goodyer hath told me, that in Hampshire, at Chichester and thereabout, they make use of this for Scurvie-grass, and that not without great errour, as any that know the qualities may easily perceiue.”

The plant is still known as *Scurvy-grass* in the Isle of Wight ; but has some of the purgative properties general in the group.

The long angular stems are often tinged with red : they exhibit but little tendency to twine. The handsome flowers are nearly, but not quite, as large as those of *C. sepium*, which they resemble in form, having their margin recurved much more than that of *C. arvensis*, and in the two leafy bracts immediately below them. The peduncle is four-sided and slightly winged. The flower varies somewhat in colour, the general hue being a deep pink, while the plaits may be yellowish or a deeper red. Some of the flowers are exclusively carpellate. They only expand in sunny weather and only last a single day.

The large roundish capsule contains smooth, black, bluntly-triangular seeds which are but little affected by immersion in sea-water. They can be propagated without difficulty and the plant can then be grown in ordinary sandy soil.

CCXXVI.—THE LESSER DODDER.

Cuscuta Epithymum Murray.

ONE of the most interesting sides to the study of Systematic Botany is the tracing the independent origins of various physiological adaptations in widely different circles of affinity. There is, for example, no connection of near affinity between such groups of parasitic plants as the Dodders, the Broom-rapes, and the Mistletoe, though the physiological requirements or possibilities of parasitism may have brought about certain structural parallelisms between these widely separated assemblages.

When one Flowering Plant so attaches itself to and penetrates another as to be able to derive part of its nutriment from it, one of the earliest changes, it would seem, to occur in the nature of the parasite is the reduction of its leaves. This economy, as, of course, it is, may be only partial, as we shall see in the cases of the Cow-wheats, Red Rattles, and certain other members of the Family *Scrophulariaceæ*; but in the Dodders it has resulted in an almost complete suppression of all foliage. Even the cotyledons of the embryo have wellnigh disappeared: only the minute bracts and floral leaves of the inflorescence are developed, the foliage being represented by extremely minute yellowish scales. This has been cited as an example of that law of anticipatory inheritance or precocity, as it has been called, which was enunciated by Darwin in the generalisation that "at whatever period of life a peculiarity first appears, it tends to re-appear in the offspring at a corresponding age, though sometimes earlier."

The relatively large seeds, four of which are produced by each capsule, are angular, like those of *Convolvulus*, and contain some fleshy albumen. In this the thread-like embryo is coiled in two or three spiral turns. On germination, the slender radicle, or downward-growing portion of the axis, which has no root-cap, is at first anchored in the ground by a few root-hairs; while the thread-like stem circumnutates in wide circles, in search, as it were, of some host-plant on which to attach itself. This stem is sensitive to contact, like a tendril, and thus tightly clasps the stem of the host; but seldom twines more than three times round the same branch. So far its behaviour has been simply that of one of its twining cousins the Convolvuli; but it is not content with the merely mechanical support of a twining plant, though the stricture of that alone may often prove fatal to the supporting species. At the points where the coils of its stem are in close contact with the stem of the host-plant, papillæ are protruded from the epidermis of the Dodder and pierce the tissue of the host. These sucker-like adhesive discs are known as *pre-haustoria*, because the effectively parasitic organ, or *haustorium*, is a somewhat later development. Originating from the internal tissue of the Dodder stem, the haustorium would seem to have all the characteristics of an adventitious root. It consists at first of thin-walled cells which contain solvent ferments, just as does the germ of a lateral



THE LESSER DODDER—continued.

root ; and, by means of these ferments and of the mechanical force of their growth, the haustorium eats and pushes its way through the cortex of the host down to its vascular bundles. Some of its rows of thin-walled cells, much resembling the hyphæ of a parasitic fungus, attach themselves to the *xylem* or wood of the bundle, others to the *phloem* or bast, and others again to the juicy surrounding cellular tissue. Vessels with spirally-thickened walls, characteristic of wood, and others known from the appearance of their partition-walls as *sieve-tubes*, which are equally characteristic of bast, then develop in the haustorium and connect the wood and bast of the parasite with those of the host. Thus, just as if it were a branch of the host-plant, the Dodder draws both the water it requires for transpiration and dissolved mineral salts from the soil, from the wood-vessels of the host, and its supplies of organic food-material, manufactured in the leaves of the host, from the vessels of its bast. Meanwhile the base of the Dodder, connecting it with the ground, will have withered, so that the plant appears to have become wholly parasitic.

The second adaptation to a parasitic mode of nutrition, however, is the loss of chlorophyll ; and, though the tangled thread-like stems of the Dodders are red or yellowish, this green colouring-matter is not wholly absent, so that, though not to the same extent as the green Mistletoe, these plants do manufacture a little carbonaceous food for themselves from the atmosphere.

The great risk that the seedling may not find a suitable host within reach necessitates the provision of a great quantity of seed ; and thus the tangled stems of the Dodders are thickly set with crowded heads of little wax-like blossoms, miniature *Convolvuli* of white or palest pink, each in the axil of a tiny bract. The setting of some seed is secured by the flowers being often cleistogene ; but those that open, though homogamous and, therefore, probably often self-pollinated, secrete honey just as do the larger flowers of the Bindweeds. This honey is generally concealed by five relatively large, fringed scales which spring from the inside of the corolla-tube, each at the base of a stamen, and these scales afford the chief means of discrimination between the different species.

The genus *Cuscuta*, the name of which (dating from Matthiolus) is probably of Arabic origin, comprises some ninety species, and their abundant small seeds, ripening at the same time as those of their host-plants, have secured for them a wide distribution in Temperate and Tropical regions. About a dozen species occur in Europe and five or six in England ; but several of these are merely introductions with special crops, such as *Cuscuta Epilinum* Weihe, which is very destructive to Flax. Other species are more varied in their choice of victims : *C. europæa* Linné, with coarse, branching stems, occurs chiefly on Nettles, Vetches, and herbaceous plants ; but the more slender *C. Epithymum* Murray, the subject of our Plate, is common on our southern heaths upon Furze, Heather, Wild Thyme, and other plants with more woody stems.

CCXXVII.—JACOB'S LADDER.

Polemonium cæruleum Linné.

THE Family *Polemoniaceæ* is a small one, comprising only eight genera, with some two hundred species in all. They are mostly herbaceous, though including both annuals and perennials, and are mainly North American, being specially well represented in Arctic and Temperate regions in the west of the continent, though a few forms extend down the Andes to Peru and Chile and a few others occur in Asia and Europe. Most members of the Family are glabrous plants with exstipulate leaves and cymose inflorescences of perfect, polysymmetric, pentamerous flowers. The calyx is inferior and gamosepalous and the corolla is contorted in the bud. The five stamens are epipetalous and alternate with the lobes of the corolla. There is a hypogynous nectariferous disk ; but perhaps the most marked structural character is the gynæceum which consists of three carpels—an uncommon number among *Sympetaleæ*—or rarely of two, four, or five, with as many chambers to the ovary as there are carpels, but only a single style. Many of them have showy flowers and are favourites in our gardens. Among these we may mention the mainly North American genera *Phlox*, *Collomia*, and *Gilia*. The tropical *Cobæa scandens* Cavanilles is a remarkable plant, climbing very rapidly by means of branching leaf-tendrils. The tendrils are extremely sensitive and circumnutate very rapidly : the peduncle goes through complex movements at different stages of flowering and fruiting ; and the large bell-shaped flowers are at first green with a fetid smell attractive to flies and afterwards become purple, sweet-smelling, and attractive to bees.

The genus *Polemonium*—two species of which are the only European representatives of the Family—was named by Dioscorides, or rather the name was used by him for some plant, it being probably derived from that of some person, either one of the two kings of Pontus named Polemon between 39 B.C. and A.D. 62, or the Athenian Platonic philosopher who died in 273 B.C., one of the kings being, considering the usual practice of the Greek herbalist, the more likely. Pliny, *more suo*, gives the silly explanation that it is from πόλεμος, *polemos*, war, because the plant caused a war between two kings, each of whom claimed to have discovered it. Gerard apparently translated the name into the inelegant *Makebate*, for which the seventeenth-century etymologist Skinner seems to have invented the explanation that the plant was credited with stirring up discord between husband and wife. It was, no doubt, the imparipinnate leaves that led to the linking of *Polemonium* with *Valeriana* by early botanists. Thus Turner, after speaking of the Valerian of the apothecaries, *Valeriana pyrenaïca* Linné, known to the ancients as *Phu*, adds :—

“There are two other kyndes of Valeriane besyde this. Of the whiche, the one is growing about water sydes, and in the moyst plasshes and in morish groundes, and it is called in englishe wyld Valerian. The other kynde is called Valeriana greca, and thys is oure commune Valerian that we vse agaynste cuttes wyth a blew floure.”

As the species does not occur in Greece, the name *Greek Valerian* is doubly inappropriate.



JACOB'S LADDER—continued.

The fourteen species of the genus are all distinctively northern, not extending to the south of the Himalayas or of the Alps.

Turner was evidently not acquainted with our species in a wild state in Britain, the first record of it as such being apparently in Merrett's "Pinax," in 1666, where, under the name *Valeriana Græca*, it is stated to grow

"On the Rocks betwixt Maxwater Tarn and Mawanco where the highest Rock standeth round like a Castle."

Ignoring this record, Ray, in his "Catalogus Plantarum" (1670), writes :—

"Greek Valerian, called by the vulgar Ladder to heaven or Jacobs ladder. Found by Mr. Lister in Carleton-beck, in the falling of it into the river Air"; adding, in the edition of 1676, "but more plentifully both with a blue flower and a white about Malham Cove, a place so remarkable that it is esteemed one of the wonders of Craven. It grows there in the wood on the left hand the water as you go to the Cove from Malham plentifully."

Though often occurring as an escape from cultivation farther south, the plant is apparently only truly wild in Britain from Staffordshire and Derbyshire to the Cheviots. Dr. Moss describes it as locally abundant in the swamps on the slopes of the fissured limestone hills of the Pennines and in the marshy places which occur in Ash-woods by stream sides, at the bottoms of streamless dales, and on slopes where springs arise, with the Globe-flower, Meadow-sweet, Water Avens, and Forget-me-not. In cultivation it is found to do better in partially shaded situations.

A short, creeping rhizome sends out numerous root-fibres and the angular, hollow aerial stem rises one, two, or even three feet, unbranched and stiffly erect, and sometimes tinged with red. The leaves have from six to twelve pairs of leaflets and a slightly winged petiole; and the numerous blossoms are somewhat crowded at the summit of the stem on slightly drooping downy stalks. The calyx, which is also downy, is cup-shaped, and the corolla, which is generally about an inch across, is rotate. The honey, secreted below the ovary, is concealed by downy valves projecting from the upper margin of the short corolla-tube, and by the dilated hairy bases of the filaments between them. When the buds open the anthers are already mature and all bend over on to the lower edge of the corolla; but at a later stage the trifid stigma comes below the anthers, and thus, as a last resource, the plant may be self-pollinated.

The rounded capsule is erect when ripe and is surrounded by the persistent calyx. It bursts loculicidally and septifragally into three valves, leaving the numerous triangular and slightly winged seeds attached to the central axis and in a cup-like hollow, whence they are scattered by the wind.

In our gardens we have several desirable and easily grown varieties of this species, with bipinnate or variegated leaves and larger blue and lilac flowers, in the centre of which the golden anthers are very conspicuous.

CCXXVIII.—THE COMFREY.

Symphytum officinale Linné.

THE Family *Boraginaceæ* is one of the larger and one of the most natural of those groups and was, therefore, recognised as consisting of plants united by close natural relationship at the very dawn of the appreciation of any natural system of arrangement. It includes some twelve hundred species in eighty-five genera, most of them perennial herbs native to the Tropical and Temperate regions, chiefly of the Old World and especially of the Mediterranean area. They mostly have scattered, exstipulate leaves, covered, as are also their stems, with stout hairs or bristles, often rising from a swollen base. This character gained them at one time the Family name of *Asperifoliæ* (rough-leaved plants). The inflorescence is very striking, being apparently a coiled-up, dorsiventral raceme, though often described as a “scorpioid cyme.” The flowers are usually perfect, polysymmetric, and pentamerous; the calyx being gamosepalous, imbricate, with the odd sepal posterior, and persistent; and the corolla hypogynous and frequently furnished with scales or folds at its throat protecting the honey secreted at the base of the usually short corolla-tube. The five stamens are epipetalous and alternate with the corolla-lobes, and their anthers are introrse; whilst there are two carpels united and resting on a hypogynous nectariferous disk. By the ingrowth of their midribs the ovary is generally divided into four one-seeded chambers, a single gynobasic style rising from the centre and often persisting, while the half-carpels become detached when ripe as indehiscent nutlets.

Though without any remarkable medicinal qualities, the members of this Family abound in an emollient alkaline, and therefore cooling, mucilage. This alkalinity of their juices is connected with the unusual prevalence of true blues in their flowers. Many of them have their flowers specially adapted to the visits of bees, and, as we shall see, recapitulate in the changing colours of their corollas the gradual evolution of those colours from primitive yellow and white.

Of twenty-seven European genera, with nearly two hundred species, we have in Britain eleven genera and twenty-four species. Six genera are here represented.

Symphytum is a group of fifteen species belonging mostly to the Mediterranean region. They are coarse, rough perennials with stalked radical, and sessile, or decurrent cauline, leaves; and drooping tubular flowers, with included anthers and the throat of the corolla closed by long ciliate scales.

The Common Comfrey (*Symphytum officinale* Linné) has a fleshy rhizome, black externally, but containing much tasteless mucilage. It gives off fleshy fibrous roots and stout, angular, branched aerial stems rising to a height of three feet and winged in their upper parts by the decurrent leaves. The purple, pink, or ochreous blossoms form tubular bells dilated above the middle, the upper part being six and the lower part eight millimetres in length. The five triangular ciliate scales



THE COMFREY—continued.

converge so as to conceal the anthers. The flower is thus adapted to pollination by bees having a proboscis not less than eleven millimetres in length ; but some humble-bees bite through the base of the corolla, thus robbing the flower of its honey without pollinating it.

The plant was named *Σύμφυτον*, *Sumphuton*, by Dioscorides, from *συμφύω*, *sumphuo*, I cohere or make to grow together, with reference to the supposed value of the plant in healing wounds ; and the Latin *Consolida*, rendered in mediæval times *Consound* or *Console*, was undoubtedly merely a literal rendering of the Greek. Pliny, however, curiously explains this name as referring to a supposed power of causing cooked meat to adhere together. The name *Consolida* being also applied to several other mucilaginous plants to which similar virtues were ascribed, such as the Daisy, the Larkspur, and the Bugle, the Comfrey was distinguished as *Consolida major*. Thus Turner, in his “*Libellus*” (1538), writes :—

“*Symphytum herbarij vocant consolidam majorem, vulgus Comfrey*” ;

whilst in his “*Names of Herbes*” (1548) he says that it is

“called in latin *Symphytum alterum* . . . in englishe comfery or Blackewurt, and in duche walde wurtz, or schwartz wurtz, in french de la confire.”

The name *Comfrey*, the Mediæval Latin *Comfirma*, had, no doubt, the same significance ; but Gerard couples the two together as *Comfrey-consound*. Possibly misunderstanding the name *Blackwort*, which refers to the colour of the rhizome, Gerard writes it also *Backwort* and *Knit-back*, saying that it is

“a most excellent medicine against all paines and consumptions of the backe.”

In Guernsey the plant has retained this repute with its old name, being there known as *Grand Console* and made into poultices for lumbago.

It is said to have been known in Early English times as *Bruisewort* ; and Ray and Buddle, in the seventeenth century, state that it was deservedly known as *Bone-set*. With this varied reputation for healing we may, perhaps, interpret the German *Wallwurz* and Dutch *Waalwurtel* as connected with *Wal*, slaughter, and implying a power to cure the deadliest wounds. At all events, when Holme’s “*Academy of Armory*” (1688)says

“The Walwort is an herb grows commonly about two cubits high ; his leaf is rifted like Bugloss, the root outwardly is black, but within white and oyley”—

the plant meant, which Messrs. Britten and Holland say they do not know, is the *Comfrey*. Professor Earle cites German names *Wellenwurz* and *Beinwell* (bone-healer), and the interpretation of *Wellen* or *Wall* as meaning well or healing.

CCXXIX.—THE BORAGE.

Borago officinalis Linné.

FAMILIAR as Borage has long been, whether as a cultivated plant or as an escape from cultivation, it has no claim to be considered indigenous. There are but four species in the genus *Borago*—one Byzantine, another a native of the Ægean, and a third, of Corsica and Sardinia. *Borago officinalis* Linné occurs throughout the Mediterranean area and may very probably be truly wild there, or may have been introduced from the Levant. In Central Europe it is undoubtedly merely, as in Britain, an escape. Its cultivation, however, is of considerable antiquity.

It seems to have been one of the various rough-leaved plants, including several members of this Family and some others, known as *Bugloss*, a name which—from the Greek βούς, *bous*, an ox, and γλῶσσα, *glossa*, a tongue, through the Latin form *Buglossa*, the translation *Bovis lingua* and its Old French equivalent *Langdebeef*—has had a long history. The name *Borago* itself first appears in the “Herbarium” of Apuleius, which may date from the fourth century. Though early jugglers with names insisted on deriving it from *cor*, the heart, and *ago*, I move, it is more probably a latinised form of some Oriental name brought, with the plant, into European medicine from Syria. Pliny, using the name *Buglossos*, says of it :—

“The main peculiarity of this plant is, that if put into wine, it promotes mirth and hilarity, whence it has obtained the additional name of Euphrosynum (promoting cheerfulness).”

We have the testimony of Turner, both in his “*Libellus*” and in his “*Names of Herbes*,” that Borage had been identified with Buglossum. In the latter he writes :

“Buglossum called of the Poticaries borago, is called in englishe borage, in duche borretsch, in french borache, borage is moyst and warme.”

Gerard quotes and translates “the olde verse,”

“Ego Borago gaudia semper ago.”
In English—“I Borage bring alwaies courage” ;

but, perhaps, the most interesting record is that of Robert Burton’s fascinatingly quaint “*Anatomy of Melancholy*” (1652). Easily recognisable figures of this plant and of a *Helleborus* appear on his frontispiece and are thus described in the “*Argument*” :—

“Borage and Hellebor fill two scenes,
Sovereign plants to purge the veins,
Of melancholy, and cheer the heart,
Of those black fumes which make it smart.”

In the text, obviously using the names Bugloss and Borage interchangeably, he writes, with his usual wealth of references :—

“Bugloss is hot and moist, and therefore worthily reckoned up amongst those herbs which expel melancholy, and exhilarate the heart . . . It may be diversely used ; as in broth, in wine, in conserves, syrups, &c. It is an excellent cordial . . . a herb indeed of such sovereignty, that as Diodorus, Plinius, Plutarch, Dioscorides, Cælius suppose it was that



THE BORAGE—continued.

fanous Nepenthes of Homer, which Polydamna, Thonis's wife (then king of Thebes in Egypt), sent Helena for a token of such rare virtue, 'that if taken steeped in wine, if wife and children, father and mother, brother and sister, and all thy dearest friends should die before thy face, thou couldst not grieve or shed a tear for them.' Helena's commended bowl to exhilarate the heart, had no other ingredient as most of our critics conjecture, than this of borage."

It is strange, after all this eulogy, to find that this traditional flavourer of cider or claret-cup, whence it is known as *Cool Tankard*, has no properties beyond the alkaline mucilage characteristic of the Family to which it has given its name. That it has this alkalinity in a marked degree—partly in the form of a high percentage of nitrate of potash—may be witnessed by the pure blue of its beautiful blossoms. Lord Avebury showed by experiment that blue is a favourite colour with bees, and Darwin has remarked that he knew no flower so much visited by bees as the Borage. The plant is often grown specially for the bees and its structure is elaborately adapted to their visits. The large conspicuous blossoms droop gracefully in loose cymose clusters, and their honey, secreted below the ovary, is concealed in the short corolla-tube by the five notched ligular scales at its throat and the bases of the stamens. The flower is protandrous and the stamens have a bifurcating filament, one branch bearing the long arrow-shaped anther, while the other acts as a lever very much as does the appendage at the base of the anther of *Erica*. The long anthers of the darkest purple form a cone round the style and are produced upwards into a point. They contain a great quantity of pollen, 60,000 grains having been estimated as the contents of each of them : it ripens gradually, and, as the anthers split down their inner surfaces from apex to base, the dry, smooth grains trickle into the tip of the cone formed by the closely touching anthers. The spur-like branches of the filaments point outwards almost to the wall of the corolla-tube ; and the bee in search of honey, having to find access to it between the bases of two of the stamens, must break apart the anthers and will then receive a shower of pollen-grains. At a later stage the style lengthens and the capitate stigma matures, projecting beyond the cone of anthers and, therefore, becoming the first part to come in contact with the visiting insect. Though self-pollination might occur with some of the remainder pollen, Darwin found that the flower's own pollen had but little effect in setting seed.

The plant is usually biennial, though sometimes annual ; and, reproducing itself readily by seed, will, if allowed to fruit, come up year after year as a weed in the garden ; but it is such a beautiful weed that few will grudge it the room it occupies. Its flowers present one of the rarest shades of colour among the plants of the world and that combined with many beauties of form. They are at first sight very suggestive of one of the larger-flowered Solanums, such as the Potato.

It need hardly be added that, in spite of its former fame and the specific name *officinalis*, Borage has long since disappeared from our pharmacopœias.

CCXXX.—THE SMALL BUGLOSS.

Lycopsis arvensis Linné.

THE first four genera of *Boraginaceæ* here described and one or two others are very closely related, forming a Tribe known as *Anchuseæ*. Linné's genus *Lycopsis*, which is one of these, is, like *Borago*, a very small one, comprising only three species; but these, though confined to Europe and western Asia, extend rather more to the north in a wild state than do the Borages. The form of the corolla is one of the simplest distinctions between these related genera, that of the Comfreys (*Symphytum*) being, as we have seen, a narrow bell or tube with a constriction, that of the Borages (*Borago*) rotate, having, that is, a very short tube and a spreading limb, while those of *Lycopsis*, *Anchusa*, and *Pulmonaria* are salver-shaped, having, that is, a tube of some length and a spreading limb.

The three species of *Lycopsis* are, in fact, so like the larger genus *Anchusa*, the Alkanets, of which there are some forty species, that Dr. J. G. C. Lehmann, in his "Plantæ e Familiâ Asperifoliarum" of 1818, sunk *Lycopsis* in *Anchusa*, in which he has been followed by Sir Joseph Hooker in the "Student's Flora." There is, however, a marked and constant difference in that the corolla-tube of the Alkanets is straight, whilst that of *Lycopsis* has a remarkable double bend in it. The anthers are included in the uppermost bend, and the throat of the corolla-tube is closed by five rounded, hairy, ligular scales or valves.

The Greek name Ἀγχούσα, *Anchousa*, is used by Hippocrates, "the Father of Medicine," in the fourth century B.C., and is said to be derived from ἄγχω, *ancho*, I constrict, the plant being supposed to be useful in closing ulcers, or, as Gerard puts it,

"most singular in deep punctures, or wounds made with thrusts."

The root of the allied *Alkanna tinctoria* Linné furnishes the red dye known as *Alkanet*, which was used in ancient times for rouge. The Arab pharmacists, probably misunderstanding the Greek name, gave these plants the Arabic name *Al kanne*, which belonged to a very different plant, the Henna (*Lawsonia inermis* Linné), with which women in the East have long been in the habit of dyeing their nails, hands, and feet. In French *Alkanet* became *Orchanet*. Several species of *Anchusa* are cultivated, our gardens now having a number of varieties—differing in the shade of blue—of the beautiful *Anchusa italica* Linné.

The name *Lycopsis* occurs in the Greek of the Ionic poet, grammarian, and physician Nicander, in the second century B.C., in what Gerard calls "his booke of Treacles," under the various forms of λύκαψος, *lukapsos*, λύκοψος, *lukopsos*, and λύκοψις, *lukopsis*, the last being employed by Dioscorides. It apparently means "resembling a wolf," from λύκος, *lukos*, a wolf, and ὄψις, *opsis*, aspect, perhaps with reference to the roughness of the plant. Fuchs called the plant *Echion*, which



THE SMALL BUGLOSS—continued.

is practically the name we now use for the allied Viper's Bugloss, whilst Rivinus, more critically, prefers *Echioides*.

The Small Bugloss was first recorded as a British plant, under the name *Buglossa sylvestris minor*, by Thomas Johnson, the editor of Gerard's "Herball," in 1629, from the neighbourhood of Dartford, Kent; whilst in his edition of Gerard, four years later, he adds, "On the drie ditch-bankes about Pickadilla." The plant no longer occurs about Piccadilly; but is not uncommon in dry, light soils, whether on sand, gravel, or chalk, in the neighbourhood of London. As it is an annual, its appearance in any one spot from year to year is uncertain. The Kentish record recalls an interesting feature in the early history of botanical study in England; for it appears in a little book the full title of which is "Iter Plantarum Investigationis ergo susceptum a decem Sociis in Agrum Cantianum Anno Dom. 1629, Julii 13" ("A journey into the county of Kent for the study of plants undertaken by ten companions on July 13, 1629"). This is the account of one of the early excursions of the Society of Apothecaries, incorporated in 1617, in which Johnson, then in business on Snow Hill, took a leading part. These "herborizings," as they were termed, intended specially for the instruction of the apprentices, continued until 1835.

This is an erect, branched, and extremely prickly plant, each of its stiff hairs rising from a scaly tubercle. There is a small tapering whitish root: the leaves are oblong, wavy, and sessile; and the small flowers are in short terminal cymes. The plant grows from six to eighteen inches high and its flowers are about a quarter of an inch across. The scales on the corolla are white, but the limb is a bright true blue.

"It is very singular," writes Alphonse Karr, "that most people are better acquainted with the stones which inhabit the depths of the earth at a thousand leagues from them, or the pearls and corals which must be fetched from the bottom of the sea, than with the flies which fly against our windows, or with the flowers which spring up under our feet, which surround us on all sides, and are before our eyes from our earliest infancy . . . Do you know a sapphire of so pure a blue as the Cornflower, as brilliant as the Salvia, or as the Larkspur? . . . We have bestowed upon each colour two demi-tones, as we have to each note of music: we say deep blue and clear blue, as we say A sharp, or B flat. I don't know whether musicians are satisfied with these divisions, but certainly colourists are not. There are thirty different clear blues, and as many deep blues . . . Let us begin our gamut. Certain hyacinths will give you first a white scarcely tinged with blue: the Parma Violet is of an extremely pale lapis blue: then comes the blue Meadow Cranesbill, then the Chinese Wistaria, then the flower of Flax, and then in order Forget-me-not, Borage, Bugloss, Salvia, Cornflower, Nemophylla, Anagallis Monelli, Plumbago Larpentæ, the long-leaved Larkspur with single flowers, then the variety with double ones which is of a metallic blue; and, last of all, as the deepest shade of blue, almost black, the berries of the Laurustinus."

CCXXXI.—THE LUNGWORT.

Pulmonaria angustifolia Linné.

THE gamut of colours, proposed by Alphonse Karr, is no mere question of artistic perception, discrimination, and nomenclature. It is connected, as we have several times had occasion to remark, with most interesting questions as to the parallel evolution of flowers and of their insect-visitors ; or, we may, perhaps, say, of the æsthetic tastes of these latter and the responsive results of natural selection in the plant-world. Commenting on the members of this Family, Hermann Müller writes :—

“Many species, in the course of their individual development, seem to recapitulate to us the evolution of their colours—white, rosy, blue, in several species of *Myosotis* ; yellow, bluish, violet in *M. versicolor* ; and red, violet, blue in *Pulmonaria*, *Echium*, &c. Here, white and yellow seem to have been the primitive colours ; and, at least in many cases, violet and blue seem to have been preceded by red—an assumption which is strengthened by the fact that many blue and violet species (*Myosotis*, *Anchusa*, *Symphytum*) give us white and rose-red varieties apparently by reversion to more primitive characters.”

Müller here confines himself to colour ; but he has elsewhere shown, as we have remarked in speaking of *Ranunculaceæ* and of *Gentianaceæ*, how colour is correlated with structure ; colour-advance, from yellow and white to red, purple and blue, with increasing structural complexity ; and the deepening of the corolla-tubes and the greater concealment of the honey, with adaptation to the visits of bees instead of flies, of Lepidoptera instead of bees, and of butterflies and hawk-moths for deep-tubed alpiners and other highly specialised floral types. It in no way detracts from the significance of this biological argument that these colour-changes also express chemical metamorphoses. The apparently colourless juice of many white flowers, such as the pretty white variety of Herb Robert (*Geranium Robertianum* Linné), turn pink on being pressed, just as the colour deepens in the plaits of *Convolvulus arvensis*, where exposed to the sun. The change from pink to violet, as we see it in the Lungwort on the roadside banks of the New Forest in early spring, is precisely similar to the change of acid red litmus-paper to the partially neutralised violet, familiar in the chemical laboratory ; while the rarer replacement of shades of “violet,” or varying mixtures of red and blue, by true blue, does but express the rarity of completely alkaline juices in the flower. The Byzantine species of Borage (*Borago orientalis* Linné), exhibiting, like the Lungwort, three shades of colour simultaneously among its blossoms, is sometimes known in gardens as *Abraham*, *Isaac*, and *Jacob*.

So too it is the two features of the simultaneous occurrence of red and blue flowers and of the white spots on the leaves which account for the great variety of popular names applied to the cultivated *Pulmonaria officinalis* Linné. *Adam-and-Eve*, *Joseph and Mary*, *Soldiers and Sailors*, and the prosaic *Bottle-of-all-sorts*, all refer to the former character ; and *Spotted Comfrey*, *Our Lady's Milksile*, *Mary's Tears*, *Lady's Pincushion*, and, of course, *Lungwort*, to the latter. Except in the form of the leaves there are few, if any, constant differences between this cultivated plant



THE LUNGWORT—continued.

and *P. angustifolia* Linné, which has every appearance of being indigenous in the New Forest. As this difference in the width of the leaves is hardly one to attract popular attention, many vernacular names belong to either plant. Flowering in April at the present day, and, therefore, as early as Lady Day (Old Style), the pretty plant seems to have attracted much notice in pre-Reformation times. Very circumstantial, for instance, is the Weymouth legend, quoted by Messrs. Britten and Holland, which tells how the tears of the Blessed Virgin falling on the leaves of this plant caused the white blotches, and that her excessive weeping, turning one of her blue eyes red, is commemorated by the two colours of the flowers. It is, therefore, perhaps, not surprising that the Catholic name *Joseph and Mary*, which is still current at Boldre for the New Forest plant, should have also near by at Wootton the contemptuous Puritan protest in the name *Donkey's-ears*. *Snake-flower* is another local name referring to the two colours of the flowers. Lobel, speaking of the cultivated species, described it as “*floribus primulæ veris purpureis*,” *i.e.* with purple flowers of the Cowslip; Gerard, in his Catalogue of his garden in 1599, called it “*Cowslips of Jerusalem*”; and the wild form, which Lobel had named *Pulmonaria foliis Echii*, is known as *Blue Cowslip* in the Isle of Wight.

Although the doctrine of signatures had only recently been formulated by Paracelsus, Gesner, in accordance with it, gave these plants the name *Pulmonaria*, from the Latin *pulmo*, the lung, with reference to the spotted leaves, about 1542. It was not until 1633, however, that *P. angustifolia* was recorded as a British plant. Johnson, in his edition of Gerard's “*Herbal*,” then says :—

“Mr. Goodyer found the *Pulmonaria foliis Echii*, May 25, Anno 1620, flowering in a wood by Holbury house in the New Forest”;

and a year later he speaks of the plant as *Long-leaved sage of Jerusalem*, and as *Buglosse Cowslips*. Dodoens had called it *Symphytum maculosum*, the origin of the *Spotted Comfrey* which appears in Lyte's translation.

The genus *Pulmonaria* differs from those in the Family that we have already described in having no ligular scales in the corolla-tube, their place being taken by five tufts of hair between the included stamens. The tube is from ten to twelve millimetres long; but, as it is wide enough to admit part of the body of a bee, the copious honey is accessible to such insects as have a proboscis eight millimetres long. The flowers are visited by butterflies as well as bees. They are dimorphously heterogonous, the long-styled form having nearly sessile anthers and smaller pollen-grains, which have absolutely no effect on the stigmas of similar flowers; while the short-styled form has long filaments, and its larger pollen-grains have some little effect on stigmas of the same form.

CCXXXII.—THE FORGET-ME-NOT.

Myosotis scorpioides Linné.

THE obvious prettiness of colour and form in familiar flowers naturally appeals to the sentimental side of human nature. Judging from the perennial popularity of little manuals of the “language of flowers,” it would seem that the amorous form of such sentimentality has largely outlived the religious associations of plants which belonged to pagan times and the “Ages of Faith.” Holly and Mistletoe at Christmas, Shamrock for one race in our islands, and Primroses for one political party, now almost exhaust the list of public associations of plants with the latter form of sentiment ; but still the babbling waters of the brook stir

“ the sweet forget-me-nots
That grow for happy lovers.”

What matter if the sentiment be a modern importation from the Continent, or if it has taken centuries to attach itself to one particular plant ! Ever since there have been young men and maidens to fall in love, there have been blue flowers to which the one can compare the eyes of the other.

The earliest mediæval notion attaching to names of which *Forget-me-not* is our modern equivalent would seem to be that of a fugitive corolla that cries Farewell or Speedwell as it falls. The German name *Ehrenpreis*, prize of honour, which is still borne by the beautiful Germander Speedwell (*Veronica Chamædrys* Linné), goes to show that it was that species which, under the French name *Sovereign vous de moy*, was woven into collars for which knights competed in the tournament. Danish herbalists certainly knew it as *Forglemm mig icke* ; and it is interesting to notice that it is apparently a spray of this plant that Fuchs holds in his hand in the fine portrait prefixed to his “*De historia stirpium*” of 1542. In Germany and Sweden, however, the names *Vergiss mein nicht* and *Förgat mig icke* were undoubtedly at an early date applied to *Myosotis scorpioides* Linné, which in the former country also obtained the name of *Echium amoris*, a curious concatenation of love and vipers. German in origin too is the poetical legend of the too heavily armed knight and his lady-love, which tells how she asked for the flowers which—somewhat unusually—grew not only out of her reach but in deep and swiftly-running water ; how he, reaching them, overbalanced ; and, as, weighted down by his armour, he sank to his death, cast the flowers to her with the cry “Forget-me-not.” In England, however, this story has been known for less than a hundred years, and it is only within that time that the name *Forget-me-not* has been attached to this *Myosotis*, as have the French and Italian equivalents, *Ne m’oubliez pas* and *Non ti scordar di me*, in their respective countries. In Smith’s “*English Flora*” (1828), for instance, it appears as “Great Water Scorpion-grass,” though in the description it is spoken of as “the Forget-me-not, or emblem of affection, among the Germans.”



THE FORGET-ME-NOT—continued.

The genus *Myosotis* comprises about thirty species, natives of the Temperate regions of the Old World, of which eight are British. Most of them are terrestrial plants, some growing in very dry situations, and their scattered, entire cauline leaves are commonly oblong and densely pubescent, so that Dioscorides's name *Myosotis*, from $\mu\upsilon\varsigma$, *mus*, a mouse, and $\omicron\upsilon\varsigma$, $\acute{\omega}\tau\acute{o}\varsigma$, *ous*, possessive *otos*, an ear, is quite appropriate to them. This semi-aquatic species (*M. scorpioides* Linné) is exceptional, not only in the genus, but also in the Family, in its comparatively glabrous surface.

The terminal dorsiventral inflorescence, tightly coiled before the flowers open, suggested the old name *Scorpiurus*, scorpion-tail, from the Greek $\sigma\kappa\omicron\rho\pi\acute{\iota}\omicron\varsigma$, *skorpios*, a scorpion, and $\omicron\upsilon\rho\acute{\alpha}$, *oura*, a tail, now restricted generically to a widely different group of plants among the *Leguminosæ*. The specific name *scorpioides*, scorpion-like, however, remains, and *Scorpion-grass*, though never, perhaps, exactly a popular name, in a country where scorpions are unknown, has been constantly employed in books, since Lyte, in 1578, declared that these plants had "none other known name than this." The corolla in this genus is very distinctive in being convolute in the bud : it has a moderately long, straight tube, the throat of which is nearly closed by five short, blunt, and notched scales, while the limb spreads in five flat, rounded lobes. The stamens are included, the filaments being very short ; and the nutlets of the fruit are smooth and rounded and generally highly polished.

Some of the terrestrial species are not very easy to discriminate, though the little *M. versicolor* Smith is readily recognisable by its small flowers being at first pale yellow or white and becoming blue, and *M. collina* Hoffmann, the flowers of which are blue from the first, by a solitary flower some little distance below the rest of the raceme. In Teesdale, at an altitude of 2,400 feet and on Ben Lawers, at 4,000 feet, the beautiful *M. alpestris* Schmidt grows on moist rocks with an intensely blue flower, as large as that of the Water Forget-me-not, which is sweet-scented in the evening.

The typical form of *M. scorpioides* Linné, which, by the by, is often named *M. palustris* in books, has a creeping and branching rhizome, sending out tufts of stout rootlets. Its ascending aerial stems may be a foot or more in height and are rather fleshy and round or slightly angular in section, growing in a gracefully flexuous direction. The scanty spreading hairs on the stems and leaves are not noticeable, nor do they detract from the shining surface of the foliage, but those on the calyx, though lying flat, are closer and more bristly, serving probably to exclude "unbidden guests." The leaves are blunt and the upper ones are slightly decurrent. The lovely turquoise blue of the slightly notched petals is intensified by the raised white ridge and bright yellow scale at the base of each of them, this "eye" acting as a honey-guide to the insect-visitors. The fruit becomes black when ripe.

Wreaths of flowering Forget-me-not are sometimes sent as presents in Germany. If placed in a soup-plate, or just touching the surface of the water in a bowl, these will send out roots and can be kept in flower for a long time.

CCXXXIII.—VIPER'S BUGLOSS.

Echium vulgare Linné.

THE genus *Echium* is at once distinguishable from most other *Boraginaceæ* by its monosymmetric flowers. Placed by itself in a Tribe known as *Echieæ*, the genus includes some thirty species, belonging mainly to the Mediterranean region. Though in some species shrubby, they are mostly, like our British species—of which there are two—large stout herbs covered with stiff bristly hairs with swollen bases, or with silky hairs, or wart-like projections. Both stems and leaves contribute in this way to what must generally be an effective protection for these plants against any browsing animal. The flowers are borne in a more or less branched spike of unilateral racemes, of which the secondary branch-systems—elongating after flowering in an outward and downward curve—alter very much the general aspect of the plant, so as to have led to its being mistaken for more than one species. The large and handsome corolla is cylindric or funnel-shaped, with no scales in the tube, but dilated upward into five monosymmetrically unequal lobes, of which the two posterior ones are the longer, the median anterior one the smallest and most reflexed. It may be white, pale blue, or a deep vinous red-purple, but most frequently opens rose-pink from the bud and rapidly becomes the same beautiful pure blue that we have in the Borage and the wild form of the Cornflower. The reddish colour of the filaments of the exerted stamens, however, somewhat modifies the general colour effect of the inflorescence. The stamens are epipetalous and, being alternate with the lobes of the corolla, four lie along the lower side of the corolla-tube, the odd posterior one being alone in the median line on the upper side. The slender bifurcating style becomes longer than the stamens, lies with them along the lower side of the corolla-tube, and is sometimes hairy. The flowers are protandrous, the anthers bursting as the corolla expands, and their conspicuous colouring attracts a great variety of bees and other insects, including butterflies and hawk-moths, to the abundant honey. The dilated corolla-tube will allow the largest humble-bees to insert their heads and the front parts of their bodies for some distance. Gynodiœcism occurs, *i.e.*, in addition to the perfect flowers just described, there are individual plants which bear only smaller flowers with included barren stamens, so that physiologically they are entirely female. In the ordinary flowers, the immaturity of the stigma in the first stage, and its subsequent protrusion by the lengthening of the style beyond the anthers, would seem to necessitate cross-pollination.

Though the nutlets are wrinkled and rough, they do not bear any great resemblance to the head of the viper, which is one explanation of the name of the plant. Dioscorides's name ἔχιον, *echion*, is certainly from ἔχis, *echis*, a viper; but, perhaps, some of the explanations of ancient names suggested by the doctrine of signatures in the sixteenth century are merely after-thoughts and have no real



VIPER'S BUGLOSS—continued.

connection with the true origin of the names. Thus Lyte, translating Dodoens, writes :—

“As the ancient Nicander writeth, Alcibiades (being asleepe) was hurt with a serpent : wherefore whan he awoke and saw this hearbe, he tooke of it into his mouth and chewed it, swallowing downe the iuyce thereof : after that he layed the herbe being so chewed upon the sore, and was healed.”

Gerard too says :—

“The roote drunke with wine is good for those that be bitten with serpents, and it keepeth such from being stung as haue drunke of it before ; the leaues and seedes do the same, as Dioscorides writeth : Nicander, in his booke of Treacles, maketh viper's Buglosse to be one of those plants, which cure the biting of serpents, and especially of the viper, and that driue serpents away.”

Matthioli, in his Commentaries upon Dioscorides, however, wrote :—

“Nature has produced in Echium, that remedy most celebrated against the bite of vipers, a seed resembling the viper's head” ;

and Lyte—or rather Dodoens—adds this to Nicander's story about Alcibiades. Turner, in his “Libellus,” calls the plant *Langdebefe* and *Cattestayle* ; and the former name is still in use for it in Central France and the latter in our eastern counties.

Echium plantagineum Linné is a Mediterranean species which occurs in western France, Jersey, and Cornwall. It has a branched inflorescence, violet flowers, a very short calyx, and very unequal stamens, the posterior one being shortest, two of the anterior ones shorter than the other two, and the longest two only slightly exserted.

Fortunately the handsome *E. vulgare* Linné is a generally distributed species, its fine spikes adorning many a waste space on the sandy sea-shore, on gravel or on bare sunny slopes of chalk. Its long tapering roots descend far into the soil : it spreads out a strong rosette of root-leaves, each with a single prominent midrib ; and we have seen its flower-spikes rising six feet from the ground. Besides the usual blue form, a white variety occurs, retaining the red colour in the filaments ; and, very rarely, a pale form, white with a tinge of blue. The plant is a biennial and flowers from June to August. It is one of many fine plants among our wild flora which are most effective when growing, but which few fortunately are tempted to gather.

CCXXXIV.—ANALYTICAL DRAWINGS OF THE BINDWEED, JACOB'S LADDER, AND BORAGE FAMILIES.

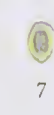
(*Convolvulaceæ*, *Polemoniaceæ*, and *Boraginaceæ*.)

WITHIN the limits of the extensive Order *Tubifloræ* the three Families represented on this Plate are closely related. All three consist mostly of herbaceous plants with polysymmetric, pentamerous, hypogynous flowers; with persistent calyx, conspicuous corolla with its tube often closed by ligular scales or hairs, five epipetalous stamens, united carpels, a single style, and a small number of seeds in each fruit. Of the eight genera represented, each by a single species, the first two belong to the *Convolvulaceæ*, the third to the *Polemoniaceæ*, and the remaining five to the *Boraginaceæ*.

The first line contains four figures illustrating the Lesser Bindweed (*Convolvulus arvensis* Linné). Fig. 1 shows the whole corolla, with its five plaits, so opened as to exhibit the stamens with their wide-based filaments. Fig. 2 is the gynæceum of two united carpels, as suggested by the bifurcate style, receptive on the inner surfaces of the fork. Fig. 3 is a cross section of a young ovary, enlarged, showing the rudiments of four ovules but not the dissepiments; and Fig. 4 is a ripe dehiscent capsule, with the persistent but withered calyx, and showing the persistent style and the four black seeds, also enlarged.

The second line of figures illustrates the Dodder (*Cuscuta Epithymum* Murray), the first two being of natural size, the rest enlarged. Fig. 1 is a flower as seen from above; Fig. 2, the same in side view; Fig. 3, the same in longitudinal section; Fig. 4, the corolla split through the middle line of one of its five lobes and opened so as to exhibit the ligular scales and the epipetalous stamens; Fig. 5, the gynæceum with the two styles, unusual in these Families, and the calyx; and Fig. 6, a transverse section of the fruit with two ovules in each of its two chambers. Figs. 3, 4, 5, and 6 are based upon the drawings of Decaisne. Fig. 7 is a slightly enlarged view of a piece of the stem with pre-haustoria.

The third line of figures represents the Jacob's Ladder (*Polemonium ceruleum* Linné), Fig. 1 being a flower as seen from above, of natural size; Fig. 2, a portion of the corolla from within, with three out of the five stamens; Fig. 3, the base of the flower in longitudinal section, showing the calyx and corolla tubes, one inside the other but distinct, the stamens inserted in the throat of the corolla and the ovary raised on honey-glands; Fig. 4, the calyx, deflexed style, and trifid stigma; Fig. 5, the gynæceum; Fig. 6, the same later; Fig. 7, the same in transverse section, the three chambers each containing two double or forking placentas, with four rows of ovules, which are thus exceptionally numerous in the type; Fig. 8 is a ripe capsule



ANALYTICAL DRAWINGS OF THE BINDWEED, JACOB'S LADDER, AND BORAGE FAMILIES—continued.

in section, surrounded by the calyx ; and Fig. 9, the same seen laterally, all these figures being of natural size.

The first Boraginaceous type is the Comfrey (*Symphytum officinale* Linné), analysed in the fourth line of figures. Fig. 1 is a flower seen laterally ; Fig. 2, a portion of the corolla, opened to exhibit the included epipetalous stamens with the ligular scales between them ; Fig. 3, the calyx and style ; Fig. 4, a cross section across the young ovary, showing the four ovules, one in each of the mericarps or half-carpels ; Fig. 5, one of the ciliate ligular scales ; Fig. 6, a stamen ; Fig. 7, the persistent calyx enclosing the fruit ; and Fig. 8, the gynæceum, when nearly ripe, with the persisting gynobasic style. All these figures are approximately of natural size.

The fifth line represents the Borage (*Borago officinalis* Linné). Fig. 1 is a flower, as seen from above ; Fig. 2, the calyx and gynæceum ; Fig. 3, a longitudinal section through a flower, showing the concave filaments and spur-like barren branches of two of the stamens ; Fig. 4, a stamen in back view (from the side nearest the corolla) ; and Fig. 5, the same seen laterally. Figs. 4 and 5 are enlarged.

The sixth line represents the Small Bugloss (*Lycopsis arvensis* Linné), Fig. 1 being a flower seen laterally of natural size ; Fig. 2, the corolla, showing its characteristic curvature ; Fig. 3, the same opened and enlarged, showing the hairs in the throat and the stamens ; Fig. 4, the calyx ; Fig. 5, the gynæceum, with the hypogynous disk ; Fig. 6, the nutlets seen from above ; and Fig. 7, a seed. With the exception of Figs. 1 and 2, all these are enlarged.

The seventh line illustrates the Forget-me-not (*Myosotis scorpioides* Linné), Fig. 1 being a flower, seen from above and of natural size ; Fig. 2, part of the corolla opened and enlarged, showing the yellow ligular scales ; Fig. 3, the calyx, in side view ; Fig. 4, the same seen from below ; and Fig. 5, the young gynæceum.

The last line represents the Viper's Bugloss (*Echium vulgare* Linné), Fig. 1 being a flower seen laterally and of natural size ; Fig. 2, the corolla opened and enlarged, showing the five stamens with red filaments ; Fig. 3, the calyx and ripening gynæceum, natural size ; Fig. 4, the gynæceum with the hypogynous disk, showing the hairy style ; and Fig. 5, the ripe nutlets and withered calyx.

CCXXXV.—THE VERVAIN.

Verbena officinalis Linné.

THE Family *Verbenaceæ*, although it has only three genera and four species in the European flora, of which the Vervain (*Verbena officinalis* Linné) alone occurs in Britain, is one of considerable extent. It includes, in all, nearly seventy genera and 750 species ; but almost all of them belong to Tropical or Sub-tropical regions. Among them are plants of a great variety of habit, numerous spiny xerophytes, lianes, mangroves, and huge forest-trees, as well as humble herbaceous plants, such as the Verbenas. By far the most valuable plant in the Family, economically speaking, is the Teak (*Tectona grandis* Linné filius), the gigantic Indian tree, the heavy timber of which is unrivalled for shipbuilding. In structure and properties the whole group is closely related to the *Labiata*, from which indeed they are mainly distinguished by having their carpels more completely united, with a terminal instead of a gynobasic style. Like the *Labiata*, they frequently abound in fragrant essential oil, the favourite Lemon Verbena of our gardens (*Lippia citriodora* Kunth), a South American shrub, for instance, yielding a “Verbena oil” which is used in perfumery. The leaves are usually opposite and exstipulate, and the flowers monosymmetric, perfect, and pentamerous. The inferior calyx is gamosepalous and persistent, the corolla usually bilabiate, the stamens didynamous and epipetalous, and the gynæceum usually composed of two carpels which become divided into four one-seeded chambers.

The genus *Verbena* comprises nearly eighty species, most of which belong to the warmer parts of America, only two being European. Small shrubs as well as herbaceous species are included in the genus : their stems are four-angled ; and their flowers are in terminal bracteate spikes or racemes, or sometimes corymbose, as in the brilliant scarlet- and purple-flowered species, which have been brought from the sunny sea-shores of South America to adorn our gardens. Honey is secreted by a ring-shaped disk below the ovary, and is protected by a ring of hairs in the tube of the corolla. Calyx and corolla are alike imbricate in their æstivation : the posterior stamen is suppressed, and of the four remaining, which are included within the corolla-tube, two are sometimes barren. Only one fork of the style becomes stigmatic and the fruit separates into four ribbed nutlets.

The name *Verbena* is unquestionably of great antiquity, though its etymology is very doubtful. It has been connected, not improbably, with the Celtic *ferfaen*, which, like Saxifrage, suggests growing between, and thus seemingly breaking, stones. Pliny, speaking of the words *sagmen* and *verbena*, says :—

“These two names no doubt originally signified the same thing—a green turf torn up from the citadel, with the earth attached to it, and hence, when envoys were despatched to the enemy . . . one of these officers was always known as the verbenarius, or bearer of the verbena.”



THE VERVAIN—continued.

It has also been proposed to connect the Latin *verbena* with the Greek *ἱερά βοτάνη*, *hiera botane*, holy herb ; whilst there seems to be a double line of tradition associating this humble plant with sacred things in pagan times—one Druidical, the other Roman. Distinguishing the two species that occur in southern Europe, *V. supina* Linné and *V. officinalis* Linné, as “female” and “male,” Pliny elsewhere writes :—

“The people in the Gallic provinces make use of them both for soothsaying purposes, and for the prediction of future events ; but it is the magicians more particularly that give utterance to such ridiculous follies in reference to this plant. Persons, they tell us, if they rub themselves with it will be sure to gain the object of their desires ; and they assure us that it keeps away fevers, conciliates friendship, and is a cure for every possible disease ; they say, too, that it must be gathered about the rising of the Dog-star—but so as not to be shone upon by sun or moon—and that honey-combs and honey must be first presented to the earth by way of expiation. They tell us also that a circle must first be traced around it with iron ; after which it must be taken up with the left hand, and raised aloft. . . . To these statements they add, that if the banqueting couch is sprinkled with water in which it has been steeped, merriment and hilarity will be greatly promoted thereby. As a remedy for the stings of serpents, the plant is bruised in wine. . . . Among the Romans there is no plant that enjoys a more extended renown. . . . With this the table of Jupiter is cleansed, with this houses are purified and due expiation made.”

Following Pliny's example, several of the herbalists of the Renaissance recognised that the renown of Vervain was magical rather than medical.

“Manie old wives' fables,” says Gerard, “are written of vervayne, tending to witchcraft and sorcerie, which you may read elsewhere, for I am not willing to trouble your ease with such trifles.”

The real interest of all this lore is, not only that the religion of one age is the superstition of the next, but that, with the gradual spread of Christianity, the old paganism seems to have survived as magic. In this connection we may set against the entry in Ælfric's tenth-century vocabulary,

“Gerobotana, vel verbena, vel sagmen, biscop-wyrtil,”

the magical prayer of the Elizabethan period, quoted by Messrs. Britten and Holland, which begins—

“All-hele, thou holy herb, vervin.”

Our species has tough wiry stems ; rough, trifid, or multifid leaves ; and small lilac flowers, which are homogamous, though frequently visited by insects. The limb of the corolla is so bent over the mouth of the tube as to protect stigma, anthers, and honey from rain. The plant is a perennial and may be seen in flower on many a waste spot, once, perhaps, the site of Druid or of Roman temple, between July and September.

CCXXXVI.—THE COMMON BUGLE.

Ajuga reptans Linné.

THIS and the nine following Plates are devoted to the illustration of the *Labiatae*, at once one of the largest and one of the most clearly defined, or “natural,” Families of Spermatophyta. It comprises nearly three thousand species in about a hundred and fifty genera. They are all herbs or undershrubs ; and, although the Family may, as a whole, be termed cosmopolitan, they have their chief centre in the Mediterranean region. There are a few semi-aquatic plants among them ; but the great majority are natives of dry, sunny localities. They mostly have strong aromatic and generally pleasant perfumes owing to the presence of abundance of volatile or essential oils throughout the plants, but especially in their leaves. In these essential oils camphor-like substances, such as menthol and thymol, are dissolved. No member of the Family is poisonous or unwholesome ; and, besides such perfumes as Lavender, Rosemary, and Patchouli, practically all our “pot-herbs” are obtained from it, including Mint, Sage, Thyme, Marjoram, Basil, and Savory.

Labiatae have square stems ; opposite and decussate, simple, exstipulate leaves ; and bilabiate flowers usually in axillary sessile cymes, two of which unite to form a verticillaster or false whorl. As these verticillasters often succeed one another racemosely, the inflorescence is “mixed.” The calyx is inferior, tubular, five-cleft, and persistent ; but inequality in the sinuses or notches between the lobes often renders it monosymmetric. The hypogynous bilabiate corolla is tubular below and has generally a posterior hood of two petals which serves to protect the essential organs from rain, and a *labellum*, or landing-place for insect-visitors, formed by the other three, the odd petal thus being anterior and the odd sepal posterior. The stamens are didynamous and generally protandrous ; and the gynæceum consists of two carpels united and forming four one-seeded nutlets with a gynobasic style and bifid stigma, just as in the *Boraginaceæ*. Though mostly perfect, the flowers are sometimes gynodiœcious. Honey is secreted by a hypogynous disk, and is generally protected by hairs in the corolla-tube ; and the floral structure as a whole is more or less specially adapted for pollination by bees, butterflies, or, in South America, humming-birds. The withered stalk of the inflorescence is sometimes hygroscopic, or the persistent calyx may be bladdery or be furnished with hooks ; but in many cases the nutlets are merely jerked by wind out of the polished interior of the calyx-tube.

The Family has been subdivided by Briquet into eight Sub-Families, of which one small one is exclusively Australasian, another exclusively Indo-Chinese, and a third entirely Central American. Three large cosmopolitan Sub-Families are represented in our flora ; and we have, in all, eighteen British genera and fifty-five species.

The Sub-Family *Ajugoidæ* contains two Tribes, of which one, the *Rosmarineæ*, is not represented in Britain. The other, the *Ajugeæ*, is characterised by the



THE COMMON BUGLE—continued.

reduction of the upper lip of the corolla to a mere trace, the exsertion of the four parallel stamens, the union of the wrinkled nutlets, so that the style is not gynobasic, and the exalbuminous seeds. It includes the two nearly-related genera *Ajuga* and *Teucrium*.

The genus *Ajuga* includes some thirty species, natives of the Temperate regions of the Old World, from Europe to Australia. They are characterised by having an ovate, bell-shaped calyx, divided about half-way down into five nearly equal segments ; a corolla with a very short, erect, bilobed upper lip and a much longer, spreading, and trilobed lower one ; four parallel stamens projecting far beyond the tube and upper lip of the corolla, but, with the bifurcate stigma, protected from rain by the leafy bract of the flower at the next succeeding node.

The origin of the name of the plant is very doubtful. Pliny says it is a corruption of *Abiga*, from *abigo*, I expel, with reference to medicinal properties ; but it seems to have been variously written as *abuga* and *iva*. A mediæval Latin diminutive form *Bugula* was used by Dodoens, Gerard, Ray, and Haller as a generic name, and is the origin of the English name *Bugle*.

Of our three British species, *A. pyramidalis* Linné is a rare plant in Highland pastures, covered with soft hairs, with its bluish-purple flowers in a compact pyramidal spike, the upper bracts of which are longer than the flowers and are pressed flat towards the axis.

The Common Bugle (*Ajuga reptans* Linné) is a familiar plant in our Spring meadows with Lady's-smock and Green-winged Orchis, especially on moist clayey ground ; or occurring socially in young coppice-woods, with Primroses, Blue-bells, Wood Anemone, Yellow Dead-nettle, and Dog's Mercury. It is perennial, having a short, thick rhizome which sends out slender ascending leafy suckers. Two lines of hairs run down opposite sides of the aerial stems, shifting to the other two sides at each node ; and the under sides of the leaves are generally reddened or darkened with anthocyan, serving to store up light as heat, supplementing the small amount received from the Spring sun. Though generally bluish-purple, the flowers are occasionally found white or pink. The lower floral whorls are some distance apart, and the plant seems to vary locally as to the order in which its anthers and stigmas mature.

Turner, the first botanist to record this species as British, speaks of it as "a blacke herbe" that "groweth in shaddowy places and moyst groundes" ; and, unquestionably, its general aspect among Spring verdure is of a dark blue shading into black.

CCXXXVII.—THE GROUND PINE.

Ajuga Chamæpitys Schreber.

THERE are few greater contrasts among British plants, within the limits of a single genus, than that between the Common Bugle (*Ajuga reptans* Linné) and the Ground Pine (*Ajuga Chamæpitys* Schreber). While the former is, as we have seen, a common, perennial, sub-glabrous, dark-foliaged, violet-flowered plant, with but little taste or smell, the latter is a rare annual, confined, in fact, to chalky fields in the south-east of England, viscidly hairy, of a light green colour, with yellow flowers and a strong smell and taste of turpentine. It is not, therefore, remarkable that this species, and those nearly related to it in the genus, seem to have attracted attention at an early date; nor that many botanists have placed them under some genus other than that which includes the Bugle. Mr. Dunn, in his "Alien Flora of Britain," suggests that it is nowhere truly wild, but has originated as a weed adapted to agricultural conditions.

"It extends," he says, "as a weed of cultivated ground, from England to Asia Minor. It is nowhere known under natural conditions. Its very near ally, *Ajuga Chia* (differing only in the size of the flowers and in degree of hairiness), is a native of the south-eastern corner of the above region, and it is possible that the former species may have originated from the latter as a modification especially adapted to agricultural conditions."

It was unquestionably one of the three sorts of *Χαμαπίτυς*, *Chamaipitus*, described by Dioscorides, and is, as Parkinson says,

"generally in these dayes helde by the best to be the third,"

which is described as

"a small herbe, having white hairy small leaves, the stalke also rough and white, with yellow flowers; the seede groweth under the leaves, and smelleth also as the Pine."

Pliny gives *Abiga* as a synonym for *Chamæpitys*, the latter being formed from *χαμαί*, *chamai*, on the ground, and *πίτυς*, *pitus*, pine, and he says it is also called *Thus terreæ*, i.e. Incense of the earth. Ruellius, one of those who, in the sixteenth century, translated Dioscorides into Latin, uses the name *Ibiga*, which others seem, as Parkinson suggests, "by an Ecclipsis" to have made into *Iva*, to which *Arthrytica* was added

"because of the propertie conducing helpe to the gout and other joint aches."

This last Dr. Prior anglicised into *Gout Ivy*. The name of the plant was known in England before the plant itself. Thus in the tenth-century English version of Apuleius we have "Chamepithys is Nepte," which is probably a mistaken identification of Dioscorides's name with *Nepeta hederacea* Trevisan, the plant which to-day we know as Ground Ivy. In 1548 Turner did not know the plant as a British species. He writes:—

"Chamepitys called in latin Aiuga, and of the Poticaries Iua muscata, is called in duche Ye lenger, and in french Iue muscate and it maye be called in englishe Grounde pyne. It groweth much in the mount Appenine besyde Bonony and aboue Bon in Germany. I haue not seene it in Englande."



THE GROUND PINE—continued.

This passage is the first coinage of the name *Ground Pine*; whilst the strange German name *Ye lenger* is explained by Parkinson, who quotes Matthiolus as saying that the plant

“is called by the Germans *Je lenger, je lieber*, that is the longer the more lovely, which as Pena and Lobel say, is the more proper name of *Dulcamara*, the wood Nightshade.”

Three years later, however, Turner, in his “Herball,” adds “I here that it is founde nowe in diverse places in england”; and in 1568 he specifies, “In good plenty in Kent.”

Translating Dodoens, Henry Lyte, in 1578, calls the plant *Field Cypress*, whilst Gerard in 1597 calls it *Forget-me-not*. This most unpoetical use of a pretty name, in reference to the plant's strong unpleasant turpentinous taste, continued down to S. F. Gray's “Natural Arrangement of British Plants,” published in 1821. It was, in fact, not till after the publication in Charles Mills's “History of Chivalry,” in 1825, of the knight-and-the-lady story, that the name *Forget-me-not* came to belong in England to *Myosotis scorpioides* Linné. Popular names are not, however, governed by the strict rules of priority which apply to scientific nomenclature. Though generally originating with the writers of popular books, they should preferably reflect the actual popular usage at any given period. It is on this principle, for instance, that we have preferred to call *Typha*, Bulrush rather than Reed-mace.

Parkinson gives a very accurate description of the Ground Pine—which he also calls *Herbe Ivie* and *Ground Ivie*—and a very full list of its names and medicinal virtues. He speaks of it as

“not growing in many other shires . . . then Kent, as farre as ever I could yet heare.”

Ray recorded the species from Cambridgeshire, its northern limit in England: it seems to have been first noticed in the north of Hampshire by Richard Yalden, the friend of Gilbert White, in 1760; and in Essex by Edward Forster in 1791. It is essentially a plant of the Chalk and is seldom found off that formation in England.

The branched spreading stem is often tinged with a reddish-brown: the hairy leaves are divided into three linear segments almost to the base—an unusual feature in this Family: the short-stalked flowers are solitary in the leaf-axils; and their yellow corollas are dotted with red on the labellum, the dots serving, no doubt, as a honey-guide. The whole plant is unpleasantly clammy and pungent. Like other cornfield weeds, it is very uncertain in its occurrence, being abundant in some years and very scarce in others.

Linné, not unnaturally, grouped the Ground Pine in the genus *Teucrium*, calling it *Teucrium Chamæpitys*; and it was correctly transferred to *Ajuga* by J. C. D. Schreber in his “Plantarum Verticillatarum Unilabiatarum Genera et Species,” in 1773.

CCXXXVIII.—THE WOOD SAGE.

Teucrium Scorodonia Linné.

THERE is certainly but little to separate the two genera *Ajuga* and *Teucrium*. The main distinctive characters of *Teucrium* are the narrower, more tubular, and less deeply cleft calyx, and the relatively deep bilobation of the short upper lip of the corolla. This latter, which is described by some botanists as being absent, is, in fact, a truncated tubular extension of the corolla-tube upwards, with no hood, and split to its base anteriorly.

The genus comprises about a hundred herbaceous, or slightly woody, plants, practically cosmopolitan, though belonging chiefly to the North Temperate and Sub-tropical portions of the Old World. Some are annuals, others perennial; but all of them are downy or hairy, bitter and aromatic; and several give off a garlic-like smell when they are bruised. Their leaves are entire, or serrate, or in rare instances more deeply divided; and their flowers, which vary greatly in colour, are in few-flowered whorls in the axils of leafy bracts. The four protruded parallel stamens are markedly didynamous, the posterior pair being the shorter; and the anthers are matured in advance of the stigmas. The flowers are well supplied with honey and are chiefly visited by bees, the anthers and stigma so changing their relative positions as to secure cross-pollination. When the flowers first open, the stamens stand erect, the imperfectly-developed style being shorter. The two pairs of stamens being of different length economise their pollen, dusting it over various parts of the upper part of the bee's body. Having discharged their pollen, the stamens bend backward and downward, the now-divergent lobes of the stigma bending forward to occupy the former position of the anthers. These two stages may obviously be considered as male and female respectively. It has been observed to be the general habit of bees to visit the lower flowers of an inflorescence first, working their way upward. They will, therefore, first visit those flowers on any one plant which, being older, have passed into the female stage, thus transferring to the stigma any pollen brought from a plant previously visited. Later on, they will be recharged with pollen by the anthers of the younger male-stage flowers higher up the inflorescence.

The name *Τεύκριον*, *Teukrion*, was given by Dioscorides in commemoration of Teucer, son of the river-god Scamander and the nymph Idæa and first king of Troy, who is said to have discovered the medicinal value of some such plant.

Of our four English species the only one that is at all common is the *Wood Sage* or *Wood Germander* (*Teucrium Scorodonia* Linné). This is a very abundant species, as common on sandy banks and open heaths as it is in woods on a similar soil. It is a perennial with a creeping, woody rhizome sending up erect, stiff, acutely four-angled, hairy, aerial stems, from one to two feet high; and also producing underground suckers. The leaves are all shortly-stalked, ovate, cordate, crenate,



THE WOOD SAGE—continued.

wondrously wrinkled, pubescent, and sage-like, but green on both sides, though with a mealiness secreting resin on their lower surfaces. The small cream-coloured flowers are borne in terminal and lateral unilateral racemose clusters ; and, though individually inconspicuous, become collectively very much the reverse, contrasting with dark Broom or Heather and with their own grey-green foliage. The calyx is pouched at its base anteriorly and divided above into two divergent lips, the posterior one consisting of a single ovate sepal, the anterior of the four others, which are small and incurved.

The name *Scorodonia*, first used by Valerius Cordus in his "Historia Stirpium" in 1561, is derived from the Greek *σκόροδον*, *skorodon*, garlic, Dioscorides having applied the similar name *σκόρδιον*, *skordion*, to an allied species, with reference to the garlic-like odour of the plant when bruised. The resemblance of the leaves of this plant to those of the Sage (*Salvia officinalis* Linné), long familiar in the herb garden, naturally suggested such names as *Salvia sylvestris*, which is literally *Wood Sage* and was employed by Tragus, and *Salvia agrestis*, i.e. *Wild Sage*, used by Pena and Lobel when giving us, in 1570, what is considered to be the first botanical mention of the plant as a native of Britain. Henry Lyte, in 1578, seems to have been the first actually to use the names *Wild Sage* and *Wood Sage*, and Gerard speaks of the plant as *Garlic Sage*.

Almost certainly, however, this species had been familiarly known under other names to our ancestors long before the botany of the sixteenth-century Renaissance. Thus vocabularies belonging to the eleventh and thirteenth centuries, reprinted by Professor Earle, say, almost in the words of Gerard's Appendix to his "Herball," that "Hindheal is Ambrosia." This Old English name *Hindheal* seemingly refers to one of the popular beliefs, like that current in India with reference to the mongoose when bitten by a snake, that deer, when wounded, had recourse to some plant ; but *Ambrose* occurs in Turner, and *Ambroise* is still used for this plant in Jersey and *Ambrouaise* and *Lambraise* in Guernsey. Withering refers to the use of the plant, under this name, in the former island, as a substitute for hops in brewing ; and Sir James Edward Smith expresses the opinion that its bitter, aromatic, and tonic properties would render it no bad material for this purpose.

The name *Wood Germander* is much more modern, dating apparently only from Smith's "English Flora" (1829). It is a somewhat inapt extension of the name *Germander* which refers to the more cut leaves of another species (*T. Chamædrys* Linné), *Germander*, from the French *gamandrée*, being—unlike though they may look—the Latin *chamædrys*, from the Greek *χαμαί*, *chamai*, on the ground, *δρῦς*, *drus*, an oak.

CCXXXIX.—THE GREATER SKULL-CAP.

Scutellaria galericulata Linné.

THE genus *Scutellaria* comprises about 180 species and is almost cosmopolitan in its distribution, but specially characteristic of Temperate and Sub-tropical regions, and of the New World rather than of the Old. There are about a dozen European species, but only two are British. They are mostly slender herbaceous plants, though a few species are shrubby, and all of them are perennial. Their leaves are simple and either entire or toothed ; and they have very little of the aromatic character so general in the Family *Labiatae*. The flowers are either solitary or in pairs, in the axils of the upper leaves or in terminal bracteate spikes or racemes ; and are often conspicuously handsome, with white, pink, purple, or yellow corollas.

The most distinctive characters of the genus are those of its calyx ; and it is from these that it derives its names. The calyx is bell-shaped below, but two-lipped above, each lip being slightly divided. Behind the upper lip is a broad, flat, hollow pouch. After the fall of the corolla this pouch acts as a hinge, and the upper lip above it falls forward over the fruit. It was this peculiarity which caused Linné to term these plants *Scutellaria*, from the Latin *scutella*, a little dish or cup. This word being a diminutive from *scutum*, a shield, the German name *Schildkraut*, shield-plant, has the same significance. The specific name *galericulata* refers to the same character, *galericulum* being the Latin for a small, round, close-fitting cap made of leather ; so that the modern English book-names *Skull-cap* and *Helmet-flower*, and the French *Toque*, all have the same reference. The corolla is much larger than the calyx and consists of two widely separated lips, with a short tube and much longer throat below. The upper lip forms a hood with three segments, the uppermost of which is concave and notched, whilst the side ones are so compressed inwards as to form a small tubular opening into the back of the throat of the corolla. This, it has been suggested by Kirchner, may be a special adaptation for butterflies as pollinating visitors. The lower lip of the corolla is expanded into a landing-place for insects, with three shallow lobes, leaving a broad triangular opening above it which, Kirchner suggests, is used by bees.

The four parallel stamens have simple unbranched filaments with incurved tips and small round anthers enclosed within the concavity of the upper lip of the corolla. Whilst there are no hairs within the corolla-tube to hold up or conceal honey, the anthers are fringed with hairs, which may serve to prevent their pollen from falling back into the corolla-tube. The posterior pair of stamens are the shorter and the longer anterior pair have *dimidiate* anthers, *i.e.* they have but one anther-chamber. The flowers are protandrous ; but in some cases some flowers are exclusively female, having aborted anthers.

The four nutlets are borne on an elongated honey-secreting axis or carpophore which is so curved as to make the ovaries oblique ; and the slender gynobasic



THE GREATER SKULL-CAP—continued.

style rises to the same level with the anthers and divides into two unequal stigmatic lobes.

Both our British species grow in wet situations and flower in late summer. *Scutellaria minor* Hudson, the Lesser Skull-cap, is a much smaller and more slender plant than the species represented on our Plate. It is only from four to eight inches high, with sub-sessile, ovate, obtuse, and almost entire leaves, and small, axillary secund flowers with a pubescent calyx, a pink hood, and a white labellum spotted with red. It is found in bogs with the Bog Pimpernel and the Ivy-leaved Bell-flower, especially in the west of England.

The Larger Skull-cap (*S. galericulata* Linné) has a creeping rhizome which sends up a stiff, erect, leafy aerial stem, a foot or eighteen inches high and often with spreading branches. Both stem and leaves are of a deep green, often tinged with violet, and may be either smooth or slightly downy. The leaves are one or two inches long, shortly-stalked, cordate, ovate-lanceolate, and crenate; and the bright violet-blue flowers, which are about three-quarters of an inch long, are solitary in the axils; but, being secund, appear as if in pairs. The calyx has no glandular hairs and the whole flower is scentless. The corolla-tube is white inside and there are often lines of white and of different shades of blue which serve, no doubt, as honey-guides.

This handsome plant is fairly common by the banks of rivers and ponds throughout Britain, while its general distribution extends from India and northern and western Asia and North Africa across Europe to North America.

A hybrid between our two British species is common at Virginia Water on the borders of Surrey and Berkshire.

The first mention of the Greater Skull-cap as a British plant is in Lobel's "Stirpium Historia" of 1576, where he states that it follows the banks of rivulets and rivers and the low-lying edges of London fields. Classing it with Willow-herbs and Loosestrifes—plants which we now consider widely different—Lobel called it *Lysimachia galericulata cæruleo-purpurea*. Gerard found it

"in a waterie lane leading from the Lord Treasurer's house called Thibals";

whilst his editor Thomas Johnson, in 1629, records it from Hampstead Heath, and in 1633 from Tothill Fields, Westminster, and the

"water side in S. James his Parke."

Tournefort, Ray, and Haller wrote of it under the generic name of *Cassida*, and Ray calls it "Hooded Willow-herb," whilst his contemporary Petiver proposed for it the name *Hood Mint*, which no one else seems, however, to have adopted. The name *Scutellaria*, which Linné afterwards adopted, was used by Rivinus in 1690.

CCXL.—GROUND IVY.

Nepeta hederacea Trevisan.

SO far as popular names are concerned there is a striking contrast between the Skull-cap with hardly any and the Ground Ivy which has a lengthy list. The latter, it is true, is a far commoner plant, and, flowering early in the year, when there are not many other flowers to distract attention, must always have been more of a familiar everyday object than the late-flowering waterside *Scutellaria*. The main cause, however, of the contrast is probably that the one plant, exceptional among *Labiatae* in having little or none of the aromatic properties general in this Family, was put to no useful purpose, whilst the other was used for a very important domestic process. Even the numerous pet-names of the Ground Ivy are, as we shall see, merely variants of those based on its uses ; and it must be borne in mind that, though all these names refer to one use, the plant seems also to have been familiar as employed for more than the ordinary variety of medical purposes to which strong-flavoured herbs were put by our forefathers. A good deal of misplaced etymological ingenuity has been wasted over some of these names ; since, though it has undoubtedly often happened that an old name of which the meaning has been forgotten has been phonetically converted into another by a sort of unconscious punning or false etymology, it is very easy to carry this principle of interpretation too far. In the Catalogue of his garden for 1599, it is true, Gerard has

“Corona terræ Alehoue” ;

but in the rhyming herbal now at Stockholm, to which we have before alluded, and which is two centuries earlier than Gerard, we have the name *tunhowe* or *tunhoo* ; and Gerard himself in his “Herball” (1597) says :—

“The women of our northern parts . . . do tun the herbe ale-hoove into their ale.”

It is not easy to improve upon Parkinson’s quaintly-worded general description and synonymy, of which the following is a slightly abridged transcript :—

“*Hedera terrestris vulgaris*. Common Ground Ivie or Alehoofe.

“This common and well knowne herbe lyeth spreadeth, and creepeth upon the ground, all about, shooting forth rootes at the joynts of the cornered tender stalkes, set all along with two round leaves at every joynt, somewhat hairy and crumpled as it were, and unevenly dented about the edges, with round dents : at the joynts likewise with the leaves toward the ends of the branches come forth hollow long flowers, gaping at the ends, of a blewish purple colour, with small white spots upon the Label or lippes that hang downe, as also in the mouth or jawes : the roote is small with fibres . . .

“The common kind is found under the hedges, and sides of fields and ditches, under house sides, and in shadowed lanes, and other waste grounds in every part of the Land almost . . .

“They flower somewhat early, and abide so a great while, the leaves keeping their verdure unto the Winter, and sometimes abiding if it be not too vehement and sharpe.

“It is thought to be the *χαμαίσις*, *Chamæcissos* of *Dioscorides* . . . no other being found that can come so neare it in face and propertie, besides the nearnesse of the name, for the Latines *Hedera humilis* is the same with *Chamæcissos*, and *Hedera terrestris* is not farre from it. Some call it *Corona terræ*, because it spreadeth and is like a Garland upon the ground. All writers generally call it *Hedera terrestris* . . . The Italians *Hedera terrestre*, the French *Lierre terrestre*, the Germans *Gundelreh*, or *Grundereb*, that is *humi repens*, the Dutch *Onderhaue* and wee in English according to the severall countries appellations, Gill creepe by the ground, Catsfoote, Haymaides, and Alehoofe, most generally, or *Tunnehoofe*, because the country people use it much in their Ale, and ground Ivie as frequently.”



GROUND IVY—continued.

Ray, in his "Catalogus Plantarum Angliæ" (1670), says very distinctly, in Latin, that the English, especially in the north, are in the habit of putting Ground Ivy into their vats to purify and clear the beer, which it usually does in a short time, in twenty-four hours, in fact, whence also is derived the name Ale-hoof or Tun-hoof. This custom, it is true, has to some extent gone out of use since the introduction of hops.

Ale-hoof is, in fact, that which makes the ale to heave or work ; but the brothers Grimm must needs derive the name from *ei*, ivy, and *loof*, leaf ; whilst Dr. Prior makes tunhoof come from the Old English *tun*, a garden, and *hufe*, a crown, as a translation of the Latin *corona terræ* or the Greek στεφάνωμα γῆς, *stephanoma ges*, garland of the ground. More plausible, perhaps, is his derivation of *Gill* from the French *guiller*, to ferment, beer fermented with Ground Ivy being known as Gill-ale. This word, he suggests, being confused with *Gill*, meaning a girl, has given us all the various pet-names, *Gill-go-by-the-ground*, *Gill-o'-the-ground*, still in use in New England where the plant has become thoroughly naturalised, *Jenny-run-ith-ground*, *Lizzy-run-the-hedge*, *Hedge-maids*, and *Haymaids*.

Linné treated this plant as generically distinct from the Cat-mint (*Nepeta Cataria* Linné), from which it differs in having axillary instead of terminal whorls of flowers, all its bracts large and leafy, a long corolla-tube, and connivent, instead of parallel, anthers. He accordingly used the name *Glechoma hederacea*, from the Greek γλήχων, *glechon*, which belonged apparently to the allied Labiate Pennyroyal (*Mentha Pulegium* Linné). As *Glechoma* is now considered merely a sub-genus of *Nepeta*, the Ground Ivy has to bear the name *N. hederacea* Trevisan, which dates only from 1842.

CCXLI.—SELF-HEAL.

Prunella vulgaris Linné.

THE genus *Prunella* comprises about half a dozen species of low-growing, hairy perennial herbaceous plants. All of them are natives of the Mediterranean region of Europe ; but three of them—*P. grandiflora* Jacquin, *P. laciniata* Linné, and *P. vulgaris* Linné—have spread over the central parts of that continent ; and the last named occurs also in western Asia, North Africa, and, as an introduced plant, in North America and Australia.

Their leaves, though simple, may be entire, toothed, or pinnately lobed ; and the flowers are collected, in whorls of about six flowers each, into dense terminal spicate heads, with two broad rounded leafy bracts beneath each whorl. The genus agrees with *Scutellaria* in its foliage not being aromatic, nor its flowers scented.

The calyx is sub-campanulate, two-lipped, with ten irregular veins, the upper lip flat with three very short acute teeth, and the lower one deeply divided into two spinously-pointed segments. In the fruit stage it persists in a shrivelled condition over the four smooth nutlets.

The corolla may be blue, purple, pink, or white. It has a broad ascending tube, with a ring of hairs near the base of its inner surface, and expanding into a wider and longer throat and a ringent limb. The upper lip is erect, concave, inflexed, and entire ; the lower one reflexed and divided into three spreading lobes which are rounded, obtuse, and crenate, the middle one being the widest. The side view of the corolla suggested a bill-hook or sickle ; and thus, in accordance with the doctrine of signatures, the plant was held to be good for the healing of wounds caused by those or other edged tools, and so acquired the names *Hook-heal* and *Sicklewort*, which are used by Lyte and Gerard respectively, and *Carpenter-grass* which is commonly used in Cheshire.

The two anterior stamens are longer than the posterior pair. The filaments are glabrous and subulate, forking at their tips and bearing a perfect anther on the lower branch of the fork. The barren branch, *i.e.* that which does not bear an anther, is much longer in the case of the longer (anterior) stamens than in that of the posterior ones. The four anthers are connivent in pairs under the upper lip of the corolla, but the two chambers of each are divergent. They dehisce transversely. The disk or carpophore is erect and symmetrical : the style is approximately equal in length to the stamens ; and it divides into two slender recurved stigmatic lobes, which, like the anthers, are protected by the hood of the corolla.

The genus takes its name from the German *Bräune*, the quinsy, which it was supposed to cure ; but, whilst Dodoens, Rivinus, Tournefort, Bentham and Hooker spell the name in accordance with this etymology as *Brunella*, Brunfels, Fuchs, the Bauhins, Smith, and others prefer the softer-sounding *Prunella*. While Lyte



SELF-HEAL—continued.

attempted to anglicise the latter into *Prunell*, Gerard similarly coined *Brunel*; but neither name seems ever to have become current.

We have two British species of *Prunella*. *P. laciniata* Linné, with pinnatifid upper leaves, longer calyx-teeth, a longer barren branch to the filaments, and larger, cream-coloured corolla, has been recorded for the Mendips in Somerset, the North Downs in Surrey, chalk downs in Berkshire, and limestone hills in Gloucestershire; whilst *P. vulgaris* Linné is more universally distributed and familiar. White and pink forms of this latter do occur; but *P. laciniata* may well prove to be more general than it is yet known to be.

The Common Self-heal (*P. vulgaris* Linné) is a common pasture plant and occurs frequently in waste-places. The late Lord de Tabley, in his "Flora of Cheshire," speaks of it as "perhaps the commonest Cheshire turf 'wild flower' after the daisy." It is often a troublesome weed in lawns, and is supposed to impoverish the soil, whence its Border name of *Heart of the Earth*, and that of *Pickpocket*, by which it is known in Essex.

It has a creeping rhizome: its short aerial stems are sometimes branched; and all its leaves are stalked and ovate-oblong, paler on their under surfaces and downy along their chief veins. The bracts in the flower-heads are ciliate and have generally purplish edges, and the same colour occurs also in the calyx. We have noticed, however, that in the white-flowered form the leaves are a lighter green and this purple tint is absent from bracts and sepals. The ordinary large flowers are perfect and protandrous; but smaller ones also occur in which the stamens are more or less completely aborted; whilst in Belgium cleistogene flowers have been described. In the fruit stage the withered calyx is closed and points upward in dry air, but becomes horizontal and unfolds when it is damp.

From the belief that its slightly astringent character made it valuable for healing wounds this plant obtained the name of *Consolida minor* or *minima*; and, as its likeness to the Bugle (*Ajuga reptans* Linné) was recognised, it was supposed to share the much vaunted properties of that species, and Parkinson refers to proverbs current among both French and Germans to the effect that he who had Sanicle, Bugle, or Prunelle would not require a surgeon. This is the true signification of the name *Self-heal*, which appears, for the first time, perhaps, in Turner's "Herball."

CCXLII.—THE WHITE DEAD-NETTLE.

Lamium album Linné.

TO the dweller in the country many *Labiatae* are very familiar. The Bugle in the Spring woodlands and meadows, the fragrant Thyme on the downs, the Horse Mint by the stream, Ground Ivy on the bank, or Woundwort in the thicket, are to him everyday objects. To those who live in towns, however, whose sight of wild flowers is for long restricted to the suburban hedgerow or waste-heap, the Family is mainly represented by the Dead-nettles. So typical are they of the group, with pungent aromatic smell, square stem, hairy, opposite, and generally serrate leaves, and distinctly two-lipped, didynamous flowers, that Messrs. Bentham and Hooker even named the Cohort which in their system includes the *Verbenaceae* and *Labiatae Lamiales* from the genus *Lamium*.

This genus comprises some forty species of herbaceous plants, some annual and others perennial, all of them natives of the Temperate regions of Asia, Europe, and North Africa, though several have been introduced as weeds into North America. Their distinctly quadrangular stems serve as a ready distinction between them and the entirely unrelated true Nettles which they so much resemble in their leaves. The leaves are generally cordate at the base, downy, and in most cases distinctly serrate. So close is their resemblance to the leaves of the Stinging Nettle that it is often difficult to persuade people of the difference.

In Ælfric's tenth-century vocabulary these plants are referred to as *Archangelica* or *Blind Nettles*: in the fifteenth-century "Ortus Sanitatis" they have the name *Urtica mortua*; and from that time onward such names as *Dead*, *Deaf*, *Dumb*, or *Blind Nettle*, the French *Ortie morte*, and the German *Taubnessel* have borne universal testimony to the resemblance. Lord Avebury and others have concluded, not unnaturally, that, as several of our English species of *Lamium* are often associated with the Stinging Nettles in a common habitat, they, perhaps, escape the attacks of browsing animals, and even those of leaf-eating insects, by their resemblance to plants protected by a powerful acid.

The flowers of *Lamium* are borne in axillary whorls, often many-flowered, with leafy bracts, which may be far apart or crowded towards the top of the stem. They are homogamous and scentless, but generally contain much honey secreted below the ovary, and have the characteristic structural features of flowers pollinated by bees or humble-bees. The calyx is tubular, rigid, and persistent, with five sub-equal bristle-like teeth; and the ringent corolla has a well-developed hood, protecting the essential organs from rain or sun, and a prominent landing-place or labellum for the insect-visitors. In the various species of the genus the corolla may be white, red, or yellow: it is sometimes marked by rows of coloured dots which act as honey-guides; and has generally a ring of hairs round the inside of its tube which protects the honey from small insects unsuited for effecting pollination. The four stamens are



THE WHITE DEAD-NETTLE—continued.

parallel, the posterior pair being the shorter ; and the anthers are connivent and have somewhat widely separated, rounded lobes which dehisce longitudinally. In most species the anthers are hairy.

Writing of the White Dead-nettle (*Lamium album* Linné), Lord Avebury, in his interesting "Notes on the Life-history of British Flowering Plants," says :—

"In few flowers is the use of the various arrangements more clearly and beautifully shown. The honey occupies the lower contracted portion of the tube, and is protected from the rain by the arched upper lip and by a rim of hairs. Above the narrower lower portion the tube expands, and throws out a broad lip which serves as an alighting place for large bees, while the length of the narrow tube prevents the smaller species from obtaining access to the honey, which would be injurious to the flower, as it would remove the source of attraction for the bees, without effecting the object in view. . . . *Lamium*, in fact, like so many of our wild flowers, is specially adapted for humble-bees. They alight on the lower lip, which projects at the side, so as to afford them a leverage, by means of which they may press the proboscis down the tube to the honey ; while, on the other hand, the arched upper lip, in its size, form, and position, is admirably adapted not only as a protection against rain, but also to prevent the anthers and pistil from yielding too easily to the pressure of the insect, and thus to ensure that it should press the pollen, which it has brought from other flowers, against the pistil. The stamens do not form a ring round the pistil, as is so usual. On the contrary, one stamen is absent or rudimentary, while the other four lie along the outer arch of the flower, on each side of the pistil. They are not of equal length, but one pair is shorter than the other ; the inner pair in some species, the outer pair in others, being the longest. Now, why is this ? Probably, as Dr. Ogle has suggested, because if the anthers had lain side by side they would have formed a too broad surface, and the pollen would have adhered to parts of the bee's head which do not come in contact with the stigma, and would therefore have been wasted ; perhaps also partly, as he suggests, because it would have been deposited on the eyes of the bees. . . . From the position of the stigma, which hangs down below the anthers, the bee comes in contact with the former before touching the latter, and consequently generally deposits upon the stigma pollen from another flower. The small processes on each side of the lower lip are the rudiments of the lateral petals with which the ancestors of *Lamium* were provided."

Of our six British species of *Lamium*, this white- or very rarely pink-flowered *L. album* Linné, and the very distinct yellow-flowered woodland *L. Galeobdolon* Crantz, which has no hairs on its anthers, as well as the garden escape *L. maculatum* Linné, which has generally large red flowers and a white stripe on its leaves, are perennial. The smaller Red Dead-nettle (*L. purpureum* Linné), common on all waste ground, with flowers crowded at the top of its stem, the Henbit Dead-nettle (*L. amplexicaule* Linné), with sessile upper leaves and flowers often cleistogene, and two others, are annuals. The colour of the flower is by no means an infallible guide to the species, white varieties occurring in the normally red-flowered species ; and hybridism being apparently not uncommon.

There is some little doubt as to the etymology of Pliny's name *Lamium*, which it seems difficult to derive directly from *λαιμός*, *laimos*, the throat, and which may, therefore, be connected with *λάμος*, *lamos*, a large cavity, or with *Λάμια*, *Lamia*, the queen of Libya, whose name was used by the Greeks as a bugbear to frighten children, whom she was supposed to devour.

CCXLIII.—HEDGE WOUNDWORT.

Stachys sylvatica Linné.

DIOSCORIDES named some plant or plants γαλίopsis, *galiopsis*, and γαλεόβδολον, *galeobdolon*, from γαλή, *galee*, a weasel, ὄψις, *opsis*, resemblance, βδόλος, *bdolos*, a stench, apparently from a fancied resemblance of the flower to a weasel, or in both cases from the unpleasant smell of the plants. What this plant, or these plants, were, it is not easy to say, though the name *Galeopsis* has now attached itself to the Hemp-nettles, and *Galeobdolon*, as a specific name, to the Yellow Dead-nettle (*Lamium Galeobdolon* Crantz). In Catholic times, moreover, various plants were known as *Archangel*, perhaps, as Dr. Prior suggests, because they were in flower by May 8th, Old Style, the feast of the Apparition of St. Michael, and might, therefore, have been supposed to be preservatives against evil spirits and witchcraft. Here again several plants appear to have been so designated. In Ælfric's tenth-century vocabulary and in another belonging to the thirteenth century, which is printed by Professor Earle, we find, "Archangelica, blinde netle"; and in the fifteenth-century "Promptorium Parvulorum" is "Archangel, defe nettylle." In his "Libellus de re herbaria" (1538), Turner writes :—

"Anonium dicitur lamium, urtica iners, urtica mortua, & anglie Archangell aut Dede nettell";
"Galeopsis, galeobdolon . . . uulgo Rede archangell."

In the "Names of Herbes" (1548) he has :—

"Lamium called also Vrtica iners and Anonium, is named in englishe dead nettle or whyte nettle, in duche Weiszneslen, in french Ortie morte, it groweth commonly in hedges."

"Galeopsis after my judgements is the herbe, whiche is called in englishe red Archangel. It is lyke Archangel, but it hath a purple floure, and lesse leaues and shorter. It groweth in hedges."

The respective editors of these two works, Dr. Daydon Jackson and Mr. Britten, identify these four plants as *Lamium purpureum*, *L. lævigatum*, *L. album*, and *Stachys sylvatica* respectively; but I prefer to consider them to be *L. album* and *L. purpureum*, as first and second in each pair of quotations. Nor can there, I think, be any doubt that the Red, White, and Yellow Archangell of Parkinson's "Theatrum" are *Lamium purpureum*, *L. album*, and *L. Galeobdolon*; while his "Long-leafed red Archangell" may be the pink variety of *L. album*; and his "*Galeopsis Genuina Dioscoridis*, the true stinking Dead-nettle of *Dioscorides*," is *Stachys sylvatica* Linné. But, as Parkinson says :—

"I will endeavour what in me lyeth, so to distinguish them, that each shall have their owne due : and if I shall not herein perhaps satisfie every one, for *quot homines, tot sententiæ*, yet I shall satisfie my selfe, who I am perswaded shall not want many partakers; and yet I cannot, nor doe challenge any prerogative of not erring in so intricate a businesse, where so many learned writers have failed before me."

While he describes the root of his Red Archangell as "perishing every yeere," and its leaves as growing closer together "round about the upper joynts," as they



HEDGE WOUNDWORT—continued.

do in *Lamium purpureum*, the following is a not inapt description of the Hedge Woundwort (*Stachys sylvatica* Linné), or, as he calls it, *Galeopsis genuina* Dioscoridis.

“This kind of Dead Nettle hath divers square, soft, and hairy stalkes, rising up to be three or foure foote high, at the joynts whereof grow two leaves a peece upon long foote-stalkes, very like unto Nettle leaves, but that they are soft and somewhat hoary or hairy, but not stinging at all, of a very strong sent somewhat unpleasant, especially growing in shadowy places, and nothing so strong in the open fields : at the toppes of the stalkes grow the flowers set in the rundles, foure or five at a space, and many of them one above another, in manner of a spike, every one standing in a greenish huske, like unto those of the former Dead Nettles, but not so great and are of a sad red or purplish colour, especially the heads or upper parts ; but the lower labells or lippes, have some white spots in them : within those huskes after the flowers are fallen, grow small round, yet somewhat rough seede, foure for the most part standing together : the roote is composed of many strings, shooting fresh heads every yeare, and increasing thereby very much.”

This plant, he says, was then (1640)

“very frequent in our land, in divers countries, as at Hampsted going from the towne to the Church, and many other places from Hampsted heath to London.”

The genus *Stachys* comprises some two hundred species of plants, mostly herbaceous, of cosmopolitan distribution, with the exception of Australasia, but chiefly belonging to the Northern Hemisphere. Their flowers are usually in terminal spikes of verticillasters (Parkinson’s “rundles”), from which the name *Stachys*, the *στάχυς*, *stachus*, of Dioscorides, meaning an ear of corn, has its origin. The sub-genus *Eu-stachys* has more or less interrupted or open spikes ; whilst the sub-genus *Betonica*, represented by the common Wood Betony (*Stachys officinalis* Franchet), has them short and densely crowded. The calyx is sub-campanulate, with five or ten ribs and five equal teeth : the corolla has a tube as long as the calyx, an arched upper lip and a lower one divided into three unequal lobes ; and the lateral lobes bend backward before withering. The anterior stamens are the longer : the filaments are parallel ; and the anthers are connivent, smooth, and longitudinally dehiscent.

There are upwards of fifty European species, six of which are apparently indigenous in England, though only four of these occur in Scotland and Ireland. Two annual species, *S. arvensis* Linné, a weed in cornfields, and *S. annua* Linné, an alien established in similar situations in Kent, have homogamous flowers ; but the perennial forms are protandrous. The corolla-tube of the Hedge Woundwort (*S. sylvatica* Linné) is eleven millimetres long and is often filled with nectar to a depth of two or three millimetres.

The name *Woundwort*, no doubt, originally referred to the use of the fresh leaves, like so many other softly downy leaves, as a styptic, though practitioners imagined later on that an infusion of the plant had a similar effect.

The Chinese and Japanese species, *S. Sieboldi* Miquel, produces numbers of small white tubers, which in form much resemble the rattle of the rattlesnake. They have a flavour resembling artichokes and are cultivated, chiefly in France, under the names of *Crosnes du Japon* or *Chinese artichokes*.

CCXLIV.—THE GIPSYWORT.

Lycopus europæus Linné.

THE genus *Lycopus* is a small one. It includes at the most some ten species of marsh plants, chiefly natives of the North Temperate Zone, and is represented in our flora by a single species. Its scientific name, *Lycopus*, is from the Greek λύκος, *lukos*, a wolf, and ποῦς, *pous*, the foot, and probably refers to the notched form of the leaf. It dates from Fuchs, in whose time wolves were far more abundant and, therefore, far more familiar objects for comparison than at present. Our species, *L. europæus* Linné, is said to be still known as *Pied-du-loup* in France.

It is, perhaps, unfortunate for the tyro that we should have to retain for two monotypic British genera names so closely similar as this *Lycopus*, meaning Wolf's-foot, and *Lycopsis*, meaning Wolf-like, the name of the Small Bugloss ; but, though there is nothing very wolf-like about either plant, the cut leaves of the Gipsywort can be easily associated in the memory with the ποῦς, *pous*, or *-pus* in the former name.

Other early writers chose to class the Gipsywort with *Marrubium*, as *Marrubium aquaticum* or *palustre*, so that, as Pliny's name *Marrubium* belonged to the Horehound, the Gipsywort was known by them as *Water Horehound*. Thus Turner places it under the very miscellaneous group *Sideritis*, *Iron-wort*, or *Woundwort*, which included plants supposed, chiefly on account of hairy leaves, to cure wounds inflicted by iron weapons, and says of it—

“*Marrubium palustre* Tragi that is water horehound . . . groweth . . . about water sydes.”

What the original meaning of *Horehound* may be is somewhat doubtful, though, perhaps, the Old English *hara*, hoary, *hune*, honey, is the most probable etymology ; but this name does not seem to have ever become popular. On the other hand, *Gipsywort* or *Gipsy-herb*, originating in the staining effect of the juice, has long been generally current. Thus Lyte, in 1578, says that it is so called

bycause the rogues and runagates which call themselves Egyptians, do colour themselves black with this herbe.”

Gerard similarly writes in 1597 :—

“Some also thinke good to call it *Herba Ægyptia*, bicause they that counterfet themselves Egyptians (such as many times wander like vagabonds from citie to citie in Germanie) do use with this herbe to give themselves a swart colour, such as the Egyptians and the people of Afrike are of.”

The name *Gipsy-herb* would seem to have been current in Ireland, since Threlkeld, in his “*Stirpes Hibernicæ*” of 1727, speaks in the same manner of the use of the plant by “those strolling cheats called gipsies.” At the same time, whether he considered it a negligible vulgarism, or whatever may have been his reason, Ray ignores this name and in his “*Synopsis*” uses only *Water Horehound*. Smith, a century later, gives both.



THE GIPSYWORT—continued.

Though closely related to the Mints, *Lycopus* is scentless. All the species are apparently perennial, but herbaceous, with acutely four-angled stems, and small and almost polysymmetric, sessile flowers. The verticillasters are many-flowered, with leafy bracts and minute bracteoles. The calyx is tubular and persistent, and is divided for half its length into five, or sometimes four, acute teeth. The corolla is scarcely longer than the calyx and is tubular or sub-campanulate in form, appearing generally to be divided into four equal blunt segments ; but as the posterior segment is somewhat broader than the rest it may represent two. Its tubular portion is only three or four millimetres deep, so that the nectar, with which it is well supplied, is readily accessible even to insects having a very short proboscis. The posterior pair of stamens are aborted, though in some cases they form small capitate barren anthers. The anterior pair are distant and mature their anthers before the stigmas : the two chambers of their anthers are parallel, or may ultimately diverge. In the Linnæan system, this genus, like *Salvia*, was by this character of its stamens separated from all its obvious kindred and placed in his Class *Diandria*, in the Order *Monogynia*, though Sir J. E. Smith, the most strenuous supporter of that system of classification, is constrained to add the admission that it “comes nearest to *Mentha*.”

Our species, *Lycopus europæus* Linné, is sometimes glabrous, and at others pubescent. Ray quotes the observation of Sherard that in Ireland it is more often hairy ; but we are not aware that any definite relation has been traced between this variation in the surface of the plant and the conditions under which it may happen to be growing. It has a creeping, slender rhizome, from which runners are given off, and the aerial stem rises to a height of one, two, or three feet. It is erect, acutely four-angled, and generally branched. The leaves are slightly stalked and their acutely pinnatifid lobing gives them a very distinctive appearance ; whilst the yellowish-green tint of the whole plant also renders it conspicuous. The small flowers are white, sometimes with a faintly bluish tint, and their anterior petal is dotted with red. Some of the smallest among them are exclusively female. The throat of the corolla is densely hairy and the four nutlets of the ovary are supported on a relatively large, hypogynous, honey-secreting disk. In the earlier, or male, stage, the stamens are exerted, while the style is not longer than the corolla and is undivided. Later, the empty anthers are borne downwards by a curvature of their filaments, while the style lengthens and the two stigmatic lobes become reflexed. Dr. Hermann Müller records the visits of a considerable variety of small insects, chiefly flies.

The plant is common on the banks of streams, ditches, and pools ; but is said to prefer clear water and a sandy or gravelly soil. It flowers from June to September.

CCXLV.—THE WATER MINT.

Mentha aquatica Linné.

THOUGH some species of Mint flourish in situations as dry as those which characterise the majority of the aromatic *Labiatae*, they must be considered as primarily a waterside group. The beautiful nymph *Mintha*, or *Mentha* as the Latins called her, was the daughter of the River Cocytus and was beloved by Dis, the god of the under-world. Persephone in jealousy transformed her into an inconspicuous herb, which grew beside her paternal waters. But, though thus losing much of her beauty of form and feature, the nymph received the new charm of fragrance, which extended even to those parts of her body that were hidden in the realm of her royal lover; for the sweet-smelling oils of the Mints are present in their branching underground stems as well as in the green stems and leaves exposed to light and air.

As a very modern poet, John Davidson sings, careless of all ancient myth :—

“Water-plantain, rosy vagrant,
Flings his garland on the wave;
Mint in midstream rises fragrant,
Dressed in green and lilac brave.”

There are, perhaps, some forty species in this genus, which is mainly confined to the Temperate regions of the Northern Hemisphere. The number of species appears, however, to be greater, partly, perhaps, because most of the species exhibit a great range of inherent variability; but also from the frequent occurrence of natural hybrids. Flowering, as they do, at about the same season of late summer; powerfully fragrant, with but slight differences of smell, or of the colours of their flowers; rich in honey; protandrous and, therefore, rarely self-pollinating; they are much visited by insects, especially by the many Diptera that frequent watery places; and, as the honey in their shallow flower-cups is accessible to all, it is probable that these visitors often go to neighbouring but distinct species indiscriminately. This has rendered the discrimination of our wild species a matter of great difficulty.

Linnæus recognised ten British species; but Ray, with the assistance of Buddle, Rand, Dale, Doody, Sherard, and other astutely critical botanists of the close of the seventeenth and the beginning of the eighteenth century, described more than sixteen. William Sole, an apothecary of Bath (1741–1802) and a most assiduous collector and cultivator of this puzzling genus, published in 1798, under the title of “*Menthæ Britannicæ*,” an admirable series of twenty-four copperplate engravings of what he considered distinct species, with descriptions and synonymy. Sir J. E. Smith, however, reduced this number to thirteen; and Babington and Sir Joseph Hooker, guided mainly by the critical study of the group by Mr. J. G. Baker, have still further reduced the list to ten or even eight.



THE WATER MINT—continued.

They agree in being perennial, with creeping rhizomes and either subterranean suckers or runners above ground. Their small flowers are crowded in many-flowered whorls ; and these may be either in the axils of widely-separated leafy bracts, as in Pennyroyal (*Mentha Pulegium* Linné) and the Corn Mint (*M. arvensis* Linné), or they may be collected together, with minute bracts, into terminal spikes or rounded heads, as in the cultivated Spear Mint (*M. spicata* Linné) of our herb-gardens and the hairy Water Mint (*M. aquatica* Linné). The calyx is tubular or campanulate, with five equal teeth, or slightly two-lipped by having deeper lateral sinuses, as in Pennyroyal ; and its throat may be closed with hairs, as in this last-named species ; or smooth, as in the others. The corolla is four-lobed and nearly polysymmetric, just as in *Lycopus* ; and, in fact, there is very little to separate the Mints from that genus except their strong perfumes and their possession of four perfect stamens. These differ from those of other genera in the Family in being of equal length : they are erect, diverging upwards, with glabrous anthers and parallel anther-lobes ; and, as we have already said, protandrous.

Whether it be the result of hybridism, or of the great facility for vegetative reproduction by suckers, it is noticeable that it has been stated on good authority that the Mints, like the Common Elm, rarely perfect their seed. This would tend to preserve the variations unchanged when once brought about by crossing.

The Water Mint, the commonest British species, is one of the most variable. Its scent varies from a fetid pungent odour to a transient Basil-like sweetness or the camphoraceous smell of Peppermint. Its stem is generally covered with short hairs pointing downward ; but occasionally plants are almost glabrous. The leaves are stalked, ovate, serrate, acute, and downy on both surfaces, and are often darkly tinged with purplish anthocyan. The flower-stalks are densely covered with white, recurved hairs ; and the flowers are a pale lavender colour and are usually collected into rounded axillary and terminal heads. The calyx is covered with hairs of various length, sloping in a direction contrary to that of those on the stalks ; and the corolla is hairy externally.

It was, no doubt, mainly of the Spear Mint that Pliny was speaking when he said that it was good to give an appetite ; while all the later herbalists agree that its smell is very “comfortable” for the head, and strengthening to the memory. Besides the use to which it is still put as a culinary herb, Gerard says :—

“The smelle reioyceth the heart of man, for which cause they used to strew it in chambers and places of recreation, pleasure and repose where feasts and banquets are made.”

CCXLVI.—ANALYTICAL DRAWINGS OF THE VERVAIN AND LABIATE FAMILIES.

(*Verbenaceæ* and *Labiatæ*.)

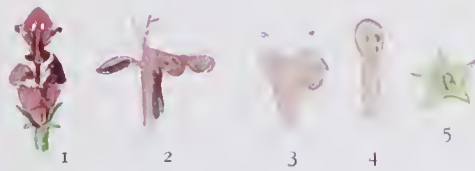
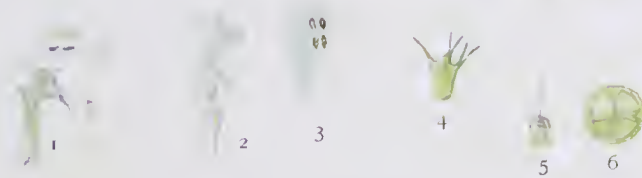
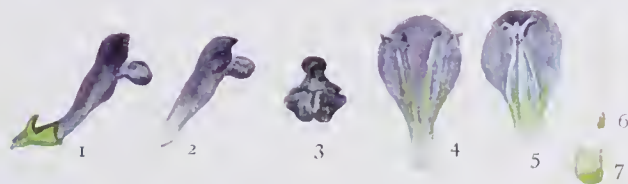
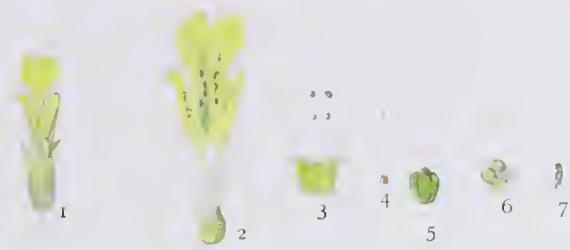
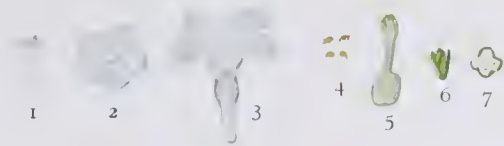
THE relationship between the two Families represented on this Plate, the *Verbenaceæ* and the *Labiata*, is so close that considerable uniformity prevails throughout the ten lines of dissections. The last line on the Plate—that illustrating the genus *Mentha*—shows that the bilabiate corolla is by no means always clearly present in the Family *Labiata*; so that it would not serve alone to exclude the *Verbenaceæ* from inclusion in that Family. The didynamous stamens are, in the main, characteristic of both Families; but in *Lycopus* and *Salvia* there are but two pollen-bearing stamens; and in *Mentha* there is little if any difference in the length of the two pairs of filaments. The main difference in the flowers of the two Families is the position of the style, which, as seen in the fifth figure in the first line, is terminal in *Verbenaceæ*, rising, that is, from the apex of the ovary, whilst in the *Labiata* it is more or less gynobasic, rising from the depression between the four nutlets. In addition to this distinction there is the difference in habit, and especially in the nature of the branching of the inflorescence, which do not come within the scope of this Plate.

In the first line, representing the Vervain (*Verbena officinalis* Linné), Fig. 1 is a flower in side view, of natural size; Fig. 2, the corolla seen from above, enlarged, showing its monosymmetric or incipiently bilabiate character; Fig. 3, the same seen laterally; Fig. 4, the didynamous stamens, about natural size; Fig. 5, the gynæceum; Fig. 6, the fruit separating into its nutlets; and Fig. 7, a transverse section.

Both the second and the third line of figures are devoted to the genus *Ajuga*, the former illustrating the Ground Pine (*Ajuga Chamæpitys* Schreber) and the latter the Bugle (*A. reptans* Linné). In the former, Fig. 1 is a flower seen from behind, so that the odd posterior sepal of the calyx is seen in the middle of the drawing and the notched anterior lobe at the top. In Fig. 2, the calyx has been cut away and the whole is enlarged; Fig. 3 shows the epipetalous didynamous stamens; Fig. 4, the gynæceum, natural size; Fig. 5, the same enlarged, showing the division into nutlets; Fig. 6, the ovary seen from above; and Fig. 7, a seed. In the latter, Fig. 1 is a flower, seen similarly from behind, of natural size; Fig. 2, the corolla opened to show the insertion of the stamens; and Fig. 3, the gynæceum, enlarged.

The fourth line of figures represents the Wood Sage (*Teucrium Scorodonia* Linné), Fig. 1 being a flower, seen from the front, of natural size; Fig. 2, the same, without the calyx, in side view; Fig. 3, the calyx, seen from the front, showing the dilated posterior lip; Fig. 4, the calyx and fruit seen from above; Fig. 5, the same in side view; and Fig. 6, the four nutlets.

The fifth line illustrates the Greater Skull-cap (*Scutellaria galericulata* Linné), Fig. 1 being a flower in profile, of natural size; Fig. 2, the corolla in the same



ANALYTICAL DRAWINGS OF THE VERVAIN AND LABIATE FAMILIES—continued.

aspect, showing the characteristic bending contraction and dilation of the tube ; Fig. 3, the front view of the same, showing the upper entrance for butterflies and the wider aperture below for humble-bees ; Fig. 4, a corolla-lobe with the epipetalous stamens ; Fig. 5, the other aspect, showing the style between the stamens ; Fig. 6, the gynæceum, natural size ; and Fig. 7, the ovary enlarged, showing the hypogynous nectary.

The sixth line represents the Ground Ivy (*Nepeta hederacea* Trevisan), Fig. 1 being a flower seen from the front, of natural size ; Fig. 2, the upper or posterior lip of the corolla with a pair of stamens indicated ; Fig. 3, the anterior and lateral lobes and the stamens ; Fig. 4, the hairy calyx and the gynæceum, enlarged ; and Fig. 5, the gynæceum alone, showing the hypogynous disk.

The seventh line of figures represents the typical Labiate *Lamium album* Linné, the White Dead-nettle, Fig. 1 showing a dissection of the corolla seen laterally. The outer surface of the hooded upper or posterior lip is hairy—an exceptional feature ; and the dark anthers are discernible beneath it ; Fig. 2 is a front view of the corolla ; Fig. 3 shows the stamens, the anther-lobes of which are placed vertically one above the other, in front of the hood ; Fig. 4, the calyx ; Fig. 5, the gynæceum ; and Fig. 6, a cross section of the four-chambered, four-seeded ovary.

The eighth line represents the Hedge Woundwort (*Stachys sylvatica* Linné), Fig. 1 being a flower seen from the front ; Fig. 2, the corolla and stamens seen laterally ; Fig. 3, the corolla with the anthers bending outwards after the discharge of their pollen ; Fig. 4, the hood with the anthers beneath it ; and Fig. 5, the calyx and ovary, as seen from above, all the figures being of natural size, and, therefore, rather impressions than microscopically elaborated.

The ninth line, on the other hand, contains three drawings of the minute flowers of the Gipsywort (*Lycopus europæus* Linné), all of which are enlarged. Fig. 1 shows a flower, as seen from above, with the broad, flat, posterior lip at the top of the figure, the fertile anthers in the throat of the tube, and the spotted labellum. Fig. 2, a lateral view, shows the long narrow segments of the calyx, the outline of the corolla, and the long style ; and Fig. 3 is the gynæceum, in the flower stage.

The last line suggests a few points in the structure of the flower of the Water Mint (*Mentha aquatica* Linné), Fig. 1 being a single flower in profile, showing three sub-equal corolla-lobes ; Fig. 2, the calyx and style ; Fig. 3, the corolla opened and so bent in dissection that the two pairs of stamens appear unequal, whereas they are in fact practically of equal length ; and Fig. 4, the gynæceum.

CCXLVII.—THE DEADLY NIGHTSHADE.

Atropa Belladonna Linné.

SOME of the early attempts of etymological guessing seem to have been very unfortunate. Dr. Prior suggests—and we have no doubt that he is right—that *Solanum* was originally *Solatrum*, meaning anodyne, from *solari*, to soothe ; but that it was mistaken for *solem atrum*, a black sun, *i.e.* an eclipse or a shade as of night, whence the Old High German *naht-scato* and the Old English *niht-scada*, our *Nightshade*.

The *Solanaceæ*, hence known as the Nightshade Family, are a considerable group, including some fifteen hundred species in upwards of seventy genera, chiefly Tropical, though occurring in most parts of the world, except the coldest. Their chief centre of dispersal would seem to be Central and South America, and we have only ten European genera with about thirty-five species, of which the three genera *Atropa*, *Hyoscyamus*, and *Solanum*, with four species between them, are the only British representatives. The Family includes herbs, shrubs, and trees ; and they have exstipulate, scattered, simple leaves and cymose inflorescences. The leaves, though never opposite, are often what is termed “geminate,” two, of which one is often, as in *Atropa*, larger than the other, occurring at one node ; and the lateral inflorescences similarly appear to be extra-axillary, owing to the suppression of alternate branchings and the adnation of bracts to the branches in their axils. The flowers are usually polysymmetric, perfect, and pentamerous, the calyx being inferior, gamosepalous, and persistent, and the corolla convolute in the bud. There is a single whorl of epipetalous stamens alternating with the petals ; and the two united carpels are placed obliquely to the median plane of the flower, the posterior one to the right and the anterior to the left. There are a ring-shaped nectariferous disk, a simple terminal style, and numerous anatropous or campylotropous ovules in each of the two chambers of the ovary. The fruit may be succulent or dry ; and in all our British forms the embryo is curved through more than a semicircle, in copious fleshy albumen, in a seed with a thick testa.

There are several important food-plants in the Family, the Potato (*Solanum tuberosum* Linné), with starchy tubers, the Tomato (*Lycopersicum esculentum* Miller), the Aubergine or Egg-plant (*Solanum Melongena* Linné), the Winter Cherries (*Physalis*), and the Chillies or Red Peppers (*Capsicum*) with edible fruits, being the chief. Most of these are South American, and the Tobaccos (*Nicotiana*) belong to the same continent. Other genera have long been used medicinally, including the Mandrake (*Mandragora officinarum* Linné), the Thorn-apples (*Datura*), Henbane (*Hyoscyamus*), and *Atropa*, the prevailing properties of the Family being narcotic and deliriant.

The genus *Atropa* contains only two species, both European ; but our Deadly Nightshade (*Atropa Belladonna* Linné) extends into Asia and North Africa and has



THE DEADLY NIGHTSHADE—continued.

been introduced into North America. It is a stout, freely branching, erect herbaceous perennial, with a thick fleshy rhizome sending out suckers, and aerial stems which reach three or four feet in height, but die down annually. The stems are downy, with viscid glandular hairs, but more or less glabrescent; while the leaves are large, stalked, ovate, acute, and entire. The plant exhales a heavy fetid odour, especially when bruised, and this may in the first instance have suggested its use as a narcotic.

Even to those who are ignorant of the dangerously poisonous character of the plant, its flowers appear as lurid and threatening. They are extra-axillary, almost solitary, and drooping, with a spreading leafy calyx and a bell-shaped corolla opening in five broad segments to nearly an inch in diameter. Its rapidly changing colours are difficult to describe. Opening a greenish-yellow externally, it becomes a brownish cream-colour and slightly pubescent, while internally it changes to a reddish-brown or chocolate hue, then acquiring a dull violet bloom and fading to a sickly brown. When the flower opens the capitate stigma is mature and it ultimately projects slightly beyond the mouth of the corolla. The filaments are curved and shorter, and are furnished with stiff hairs which protect the honey secreted below the ovary; whilst the heart-shaped anthers mature later. The structure is adapted to the visits of humble-bees.

The flower is succeeded by a spheroidal, violet-black, polished berry, resembling a small cherry, but for the persistent calyx; and, as it is not only attractive in appearance but has also a sweetish taste, the plant is very dangerous in any place accessible to young children.

It is still fairly common on the Chalk and other calcareous soils, especially in the south-east of England; but was once far more abundant and seems to have been considerably planted and used as a sedative. Latterly it has been wisely eradicated in the neighbourhood of houses.

Turner in his "Libellus" mentions it as *Solanum soporiferum* or *Dwale*; and it is clear that this Old English name for the plant means an opiate, that which dulls pain. As such it may well have been valued by the Cistercians of the twelfth-century abbey of Furness on whose seal the plant is represented. The name *Belladonna* refers, however, according to Parkinson, to the use of

"the distilled water thereof by Italian dames to take away their high colour and make them looke paler."

Clusius, recognising the dangerous character of the plant, named it *Solanum lethale*, the original of our *Deadly Nightshade*: Linnæus in separating it as a distinct genus named it *Atropa*, after Atropos, the inevitable Fate, Milton's

"blind Fury with the abhorred shears, [who] slits the thin-spun life";

and thus the alkaloid to which the action of the plant is due is known as Atropine.

CCXLVIII.—THE HENBANE.

Hyoscyamus niger Linné.

IT is with reluctance that one gives way to a feeling of repugnance towards any of God's creatures. It is, perhaps, mainly because of our knowledge that many of them are poisonous that we most of us have such a feeling towards snakes. How far such prejudices are merely matters of association it is often difficult to say ; but, when we first meet with a plant with a strong smell of mice, which is clammily sticky to the touch, and has cream-coloured flowers veined with a dull violet, some of our dislike may well be independent of any knowledge that the plant is poisonous. These are some of the characters of the Common Henbane (*Hyoscyamus niger* Linné).

The genus includes ten or a dozen species, natives of the Warmer Temperate regions of Asia, Europe, and North Africa, about half of them being natives of southern Europe, but only one appearing in our British list. This one species is, perhaps, indigenous on sand-dunes near the coast, and possibly elsewhere ; but it is found chiefly in waste-places ; and, having formerly been much cultivated for medicinal purposes, is probably generally an escape ; whilst, being annual, or at most biennial, it is not at all constant in its occurrence at any one spot. Turner, the first botanist to record it as British, says in his "Herball" (1551):—

"Henbayne . . . groweth aboute the sea-syde and about guttures and ditches, about townes and cytyes."

It has a spindle-shaped root, and a stout, terete stem, branching in a bushy manner and bearing crowded and mostly sessile or amplexicaul, pinnately-lobed or sinuate, soft or limp leaves. The plant is sometimes over a foot high, and its whole surface is greyish-green from the colourless glandular hairs with which it is thickly covered. These hairs render the plant clammy and apparently give off its fetid smell. The flowers are sub-sessile, borne in cincinni, forming two rows on the upper surface of the branches among the upper leaves. They sometimes succeed one another to a considerable number ; but we have never seen the plant as luxuriant in England as we once did at Ustyug on the Northern Dvina, where it formed arching sprays from two to three feet long, some of them bearing nearly a hundred blossoms. In some cases the last-formed flowers are stated to be cleistogene.

The calyx is campanulate with five leafy lobes, ventricose below, and pubescent ; and it enlarges and persists in the fruit stage as an erect pale brown bell. The corolla is monosymmetrically funnel-shaped, with a short tube and five spreading rounded lobes of which the posterior one is the broadest. It is of a creamy white or yellowish colour, generally with the centre and a complex veining of violet-purple, though it also occurs with little or no such veining. The stamens are inserted near the base of the corolla-tube, are somewhat unequal in length and declinate, and have hairy filaments and heart-shaped purple anthers dehiscing by slits, much as in *Atropa*. Honey is secreted below the ovary and the flowers are visited by



THE HENBANE—continued.

humble-bees ; but they are homogamous, not protogynous like those of *Atropa*. The capitate stigma is at first above the anthers ; but the growth of the corolla-tube brings the latter up to the same level, so that self-pollination becomes possible. The most distinctive character of the genus is the fruit, the two carpels forming a two-chambered capsule, enclosed within the persistent calyx and constricted with a flat belt near its convex apiculate lid which separates circumscissilely.

John Clare graphically speaks of

"Hunting from the stack-yard sod
The stinking henbane's belted pod,
By youth's warm fancies sweetly led
To christen them his loaves of bread."

The numerous grey kidney-shaped and minutely tuberculate seeds are jerked out of these erect capsules a few at a time by the action of the wind.

The name *ῥοσκύαμος*, *huoskuamos*, or hog's-bean, from *ῥῖς*, *ῥὸς*, *hus*, *huos*, a hog, *κύαμος*, *kuamos*, a bean, under which Dioscorides describes three species apparently of this genus, does not seem very appropriate ; while the vernacular names are even more obscure. It is true that Matthiolus gives the obvious explanation that hens are poisoned by the seeds ; but *Henbell* seems an older name than *Henbane* and *Belene* is a very early English name. This has been supposed to refer to the rows of dry bell-shaped calyces which remain on the withered branches in autumn—an interpretation that gave rise as early as the eleventh century to the Latin *symphoniaca*, just as we have seen the Wild Hyacinth to be known as Ring-o'-bells. *Belene*, however, is paralleled by a Portuguese name *Beleno*, a Russian *Belena*, a Hungarian *Belend*, Polish *Bielun*, German *Bilse* and earlier *Belisa* ; and this widespread series has suggested a connection with Belenus, the Celtic Apollo and tutelary deity of Billingsgate.

The plant was undoubtedly largely used as a sedative and its capsules are still smoked as a rustic remedy for toothache. Mrs. Carlyle, in one of her letters, refers to taking Henbane for insomnia, and the plant was then grown on a large scale about Mitcham. It is, however, a dangerous remedy, sometimes producing delirium, and even proving fatal. The use of the alkaloid Hyoscin in a recent case of murder will be remembered, and there can be no doubt that it was the "juice of cursed Hebenon" that Hamlet's uncle poured into his brother's ear, since Holland's Pliny, published shortly before the play, says :—

"An oile is made of the seed . . . which if it be but dropped into the eares is ynough to trouble the braine."

CCXLIX.—THE WOODY NIGHTSHADE.

Solanum Dulcamara Linné.

THE genus *Solanum* is one of the most extensive among Flowering Plants. It comprises some nine hundred species, distributed over most of the Temperate and Tropical regions of the globe, but especially well represented in South America. Some are annual herbs, such as our white-flowered but black-berried *Solanum nigrum* Linné; and some are small trees; but the majority are, like the species which we term for this reason Woody Nightshade, shrubs. The best known of all nowadays is certainly the Potato (*Solanum tuberosum* Linné), probably a native of Chile. It seems to have been brought from Quito into Europe by the Spaniards early in the sixteenth century; and, whatever part Rawleigh may have played in introducing it into Ireland from Virginia about 1586, Gerard certainly prided himself on having much to do with bringing it to England. He grew it in his garden in Holborn in 1596 as *Papus orbiculatus*, and, a year later, not only does he give an excellent figure of the plant, as *Battata Virginiana*, in his "Herball"—perhaps the first figure of the species ever published; but for a frontispiece to his book he chose his own portrait holding a sprig of Potato. Though always grown for its starchy tubers, the Potato has a handsome blossom; but various other species are cultivated solely for their flowers. Among these the most beautiful are, perhaps, the climbing, white-flowered South American *S. jasminoides* Paxton, which is hardy in the south of England, and the even more striking *S. Wendlandii* Hooker filius, from Costa Rica, with clusters of violet flowers each over two inches across, which is, however, more tender.

The leaves throughout the genus are scattered; but, owing to the curious suppression of alternate branches in this Family, to which we have already alluded, they are often geminate; and by the same mode of growth the flower-clusters also are commonly extra-axillary. The leaves are generally simple, though sometimes lobed; and the flowers are in cymose clusters. The symmetrical rotate corolla, with the short tube and spreading limb which contrasts with the bell-shaped flowers of *Atropa*, *Hyoscyamus*, or *Datura*, is characteristic of the genus; as are also the exerted anthers connivent into a cone round the style and opening by terminal pores, which much resemble those of the Borage. The two-chambered berry contains a number of kidney-shaped seeds.

The Woody Nightshade (*Solanum Dulcamara* Linné) is a striking plant, whether in summer, when, clambering in the hedgerow or luxuriating amid the rank vegetation by the waterside, it bears aloft its clusters of handsome violet gold-centred blossoms; or in autumn, when these are succeeded by the polished oval berries, changing from a vivid green to bright scarlet. As it occurs over extra-tropical Asia, North Africa, and most of Europe, it is strange that it has not been identified with certainty as known to the early Greek botanists, the name γλυκύπικρος, *glukupikros*, from γλυκύς, *glukus*, sweet, and πικρός, *pikros*, bitter,



THE WOODY NIGHTSHADE—continued.

being apparently only of Renaissance origin. Dodoens called it *Dulcamara*, a name which lingers not only in Linné's specific name but also in the French vernacular *Douce-amère*. Turner, in his "Herball" (1568), says :—

"Amara dulcis . . . Bitter swete . . . groweth about ditches and watery places and hedges" ;

explaining that when the bark of the stem is first tasted it is bitter, and that afterwards it is sweet. This transposition of the Latin words survives in the Guernsey name *Amer-dou* ; and Parkinson says that the plant was one of those known in Germany as *Je lenger je lieber*, the longer the sweeter, obviously for the same reason. Some of the early botanists termed it *Solanum lignosum*, and this from Lyte's time has been literally rendered as *Woody Nightshade*. Another old name for the plant is *Fellonwort*, from its use in the cure of "fellons" or whitlows, the Latin *furunculi*. Thus Cole, in his "Adam in Eden" (1657), writes :—

"The leaves or berries stamped with rusty bacon, applyed to that joynt of the finger that is troubled with a felon, hath been found to be very successful for the curing of the same."

Probably too it is the *Blue Bindweed* in Ben Jonson's "Vision of Delight" (1617), where he says :—

"Behold
How the blue bindweed doth itself infold
With honeysuckle, and both these intwine
Themselves with bryony and jessamine."

The rhizome extends through a considerable area of ground and the aerial stem will clamber to a height of eight, ten, or fourteen feet, being assisted in doing so by the high angle of the branches and leaf-stalks. There is considerable variation in the surface, which may be glabrous, pubescent with appressed or spreading hairs, or woolly. The upper leaves are hastate or have two spreading auricles or basal lobes, each narrowed into a stalk-like base. There is no honey in the flowers ; but the violet corolla is veined with a darker shade and has two polished green knobs at the base of each petal. Hermann Müller calls these "sham nectaries" ; but it has been suggested that insects, which may often be seen exploring the blossoms, pierce these projections and obtain a sweet juice from them.

The juicy fruits are supposed to be dangerous, containing the poisonous principle known as solanine. Birds, however, eat them freely, while the thick pitted testa of the seeds protects them from digestion. In this way, no doubt, the plant is widely disseminated and in its young state it is very tolerant of shade and of drought. There is a very distinct variety inhabiting the sea-shore on our southern coasts, prostrate in growth and somewhat fleshy in texture.

CCL.—THE DARK MULLEIN.

Verbascum nigrum Linné.

THE Family *Scrophulariaceæ* exhibits in its structure and physiology many indications of great specialisation. It includes few trees, but has produced forms adapted to very varied conditions, including, amongst others, climbers, xerophytes, and semi-parasites. Its flowers are often large : they generally secrete honey ; and they include polysymmetric and monosymmetric forms and forms with the normal five stamens, with four didynamous ones, or with two. Self-fertilisation is generally possible in default of insect visits. Its fruit is generally a dry, many-seeded capsule, though occasionally a berry, and the seeds are sometimes compressed and winged, so that dispersal by wind is facilitated. It is not, therefore, surprising that, in spite of its probably recent geological date, the Family has proved itself successful by its numerous genera and species and its cosmopolitan range. It comprises some 180 genera, with 2,000 species.

Though the distinction between this Family and the *Solanaceæ* is not very readily discerned—it is the symmetrical position of the two carpels with their midribs in the median plane, instead of being oblique to it, as they are in the Nightshades—the *Scrophulariaceæ* are a well-defined or “natural” group. Within their limits of variation, however, there is so much difference that we have thought it well to illustrate nine out of the sixteen British genera.

The stem in this Family is not usually square ; and the leaves, though exstipulate and usually simple, are rarely opposite. The inflorescence, though sometimes, as in the Mulleins and Foxgloves, apparently spicate or racemose, is, perhaps, always essentially cymose ; and has generally both bracts and bracteoles. The calyx is gamosepalous and persistent, with the odd sepal posterior : the posterior stamen is generally suppressed, though not so uniformly so as among *Labiatae* : there is a hypogynous honey-secreting disk ; and the fruit is usually a two-chambered, many-seeded capsule. The plants of this Family are sometimes strongly scented, but are not as a rule aromatic like the Labiates : most of them are poisonous ; but their large flowers render many of them favourites in our flower gardens. Among these are the Snapdragons (*Antirrhinum*), *Calceolaria*, *Mimulus*, *Pentstemon*, the Foxgloves, and the Veronicas.

With reference to their cross-pollination by insects, Hermann Müller divided the *Scrophulariaceæ* into four types, each of which we shall be able to exemplify in turn. These are (i) the open flower, or *Verbascum* and *Veronica* type ; (ii) the *Scrophularia*, or wasp-flower type ; (iii) the long tube, or *Digitalis* and *Linaria* type ; and (iv) the loose-pollen, or *Euphrasia* type.

The genus *Verbascum* contains about 160 species, natives chiefly of the Temperate regions of the Old World. We have six British species, and natural hybrids between most of them occur not uncommonly in a wild state. Most of the species



THE DARK MULLEIN—continued.

are thickly covered with soft woolly hairs. These are probably in the first instance an adaptation to the dry, sunny situations in which these plants occur, lessening transpiration. Secondly, the hairs may also serve to protect the plants from browsing animals or from small creeping honey-robbing insects. Directly or indirectly, it is to these hairs that the plants owe all their names. Pliny's *Verbascum* is said to be a corruption of *Barbascum*, from *barba*, a beard. Dioscorides called the plants *φλόμος*, *phlomos*, apparently from *φλέγω*, *phlego*, I burn. This occurs in Ælfric's vocabulary as *Fromos*, *lucernaria*, or *candel-wyrt*. The Grete Herball of 1526 speaks of *Verbascum* as "a plant whereof is made a maner of lynke, if it be talowed": Dodoens says it was called *Candela*, because it has soft, hairy leaves, fit for the wick of lights; and this is probably the origin of our Old English name *Hag-taper*, i.e. hedge-taper, for the large *Verbascum Thapsus* Linné. An early German name is *Wollkraut* or *Wullen krut*, Gerard's *Woollen*; besides which there are the Old English *Feltwort*, the French *Moleine*, from the Latin *mollis*, soft, adopted with us as *Mullein*, but in a thirteenth-century vocabulary rendered by an English name *Softe*, and many modern local variants, such as *Adam's Flannel*, *Duffle*, and *Beggar's Blanket*. Gerard says that a drink made from the leaves was used, especially in Kent, as a remedy for coughs in the case of cattle, for which reason the plant was called *Bullock's Lungwort*; and in New England Mullein syrup, made with honey or molasses, is still employed for the same ailment in human beings.

The Mulleins are large perennial herbs, with tap-roots which become transversely wrinkled by contraction as they pull the plant downwards. Kerner calls attention to the way in which the leaves, lessening in size upwards, droop at their tips and thus discharge the rain-water into the channelled midribs of the leaves below them, so that it all ultimately reaches the tap-roots. The short-tubed open corollas are chiefly visited by bees in search of pollen, for the honey is small in amount; but the red hairs on the stamens of the Dark Mullein (*V. nigrum* Linné) render the flowers more conspicuous and, no doubt, serve to protect what honey there is. The presence of five perfect stamens approximates the genus to the *Solanaceæ*; but as neither they nor the petals are absolutely equal in size the flower of *Verbascum* is not quite as symmetrical as that of the allied Family. The flowers are homogamous; but the stigma is so bent downward as to come in contact with a bee visitor before the anthers would do so. It has, moreover, been demonstrated, in the case of this and other species, that the stigma is absolutely incapable of being pollinated by pollen from the same flower.

The Dark Mullein (*V. nigrum* Linné) is so called because, though its leaves are more or less pubescent with stellate hairs on their under surfaces, they are almost glabrous on the upper side and, therefore, appear of a green which is dark in comparison with the densely woolly *Verbascum Thapsus* Linné.

CCLI.—THE YELLOW TOADFLAX.

Linaria vulgaris Miller.

THE Mulleins with their five stamens and nearly polysymmetric flowers represent an exceptional, though probably a primitive, type of *Scrophulariaceæ*. In this connection it is noteworthy that though some of them, such as *Verbascum phæniceum* Linné, have flowers which vary to copper-colour, violet, and red, the majority show only the primitive yellow or white. When we pass to the Toadflaxes, Snapdragons, Calceolarias, and Monkey-flowers we are dealing with a more highly specialised group. The flower is almost always monosymmetric and rich in honey : the posterior stamen is suppressed ; and, though true blues rarely, if ever, occur, orange, copper-colour, scarlet, and other reds, and violet-purples are frequent. This is the type to which the majority of the Family *Scrophulariaceæ* conform.

The genus *Linaria* comprises about 125 species, mostly natives of the extra-tropical portions of the Northern Hemisphere, especially in the Old World, but represented also in South America. Upwards of ninety species are natives of Europe. Though either annual or perennial, they are mostly herbaceous, few species becoming shrubby. Their lower leaves are often opposite, or in whorls of more than two ; and the outline of the leaf varies very widely in the different species. It is closely correlated with the habit of the plant. In those species, such as the Common Yellow Toadflax (*Linaria vulgaris* Miller) and the much less common *L. repens* Miller, in which the stem is erect, the leaves are linear, take an ascending direction, are in several vertical rows or orthostichies, and are often glaucous. These seem to be adaptations to reduce transpiration and fit the plants for dry, sunny situations and, perhaps, for competition with Grasses ; and it is to this type of foliage that the plants owe the names *Toadflax* and *Linaria*, since it much resembles that of the true Flaxes (*Linum*), though, having no valuable strong fibre, it bears the contemptuous prefix Toad. Prostrate trailing species, on the other hand, such as *L. Cymbalaria* Miller, *L. Elatine* Miller, and *L. spuria* Miller, have broad leaves so disposed as to form a mosaic with a minimum of overlapping but capturing the maximum of light from above and of radiated heat from the ground.

The flowers are in bracteate spikes or racemes : the calyx is deeply divided into five lobes ; and the corolla is personate and spurred. The personate or mask-like form of corolla, from the Latin *persona*, a mask, is a modification of the bilabiate type, its five petals being united in a tube below and divided into two lips above, the posterior of two petals and the anterior of three. The anterior lip or labellum, however, is inflated or tumid from below upwards, and so tightly closes the entrance to the corolla-tube that it requires the weight of a comparatively heavy insect to depress it and thus gain access to the tube. This tumid labellum is known as the *palate*, and the region of access in these plants is often indicated by differences of colour between the two lips.



THE YELLOW TOADFLAX—continued.

The Toadflaxes are mainly distinguished from the Snapdragons, *i.e.* the genus *Linaria*, as named by Tournefort, Hill, and Miller, from *Antirrhinum*, with which Linné united it, by having a spur at the base of the corolla, instead of a mere pouch. This spur is merely a receptacle for the honey which is secreted by the hypogynous disk just below the ovary and streams down into this pointed receptacle. The length of such a spur is, however, physiologically an advance in specialisation on the pouch, as it adds, with great economy of material, to the depth of the corolla-tube and thus restricts the rewarding honey to long-tongued large and heavy insects which will be certain to come in contact with stigma and anthers and thus effect cross-pollination.

The fruit in this genus is a capsule which is generally erect, its two nearly equal chambers opening by terminal pores which are sometimes surrounded by tooth-like valves, so that the angular or discoid seeds are economically shaken out by what is termed “censer-action,” a few at a time.

The commonest, but by no means the least beautiful, British species of *Linaria* is the Yellow Toadflax (*L. vulgaris* Miller), which Linné named *Antirrhinum Linaria*. It will flourish in extremely poor, dry, and porous soil, on gravel or sand or pure chalk, rejoicing in the full glare of the sun. It is a perennial with a somewhat woody creeping rhizome, each year's aerial growth springing from an adventitious bud near its summit and rising erect to the height of one or two feet. The thickly-set leaves are mostly linear and one or two inches long with three faint longitudinal veins; and both they and the stems are glabrous and glaucous; but the flower-stalks bear glandular hairs. The flowers are crowded in a terminal raceme, the blending of its general primrose-yellow with the deep orange of the downy palate naturally suggesting such popular names as *Butter-and-eggs* and *Eggs-and-bacon*. Each flower is an inch in length, the spur equalling the length of the tube and five times as long as the green calyx, and pointing perpendicularly downward. When the bee forces apart the two lips of the corolla, it finds a band of close-set orange-coloured hairs extending down each side of the inner surface of the palate with a clear space between them leading directly to the spur, which is part of this anterior petal. The flowers have no perfume, but are sufficiently conspicuous without it. Though a fifth posterior stamen would apparently be only in the way in this method of insect-pollination, it is sometimes represented by a vestigial structure. The two chambers of the capsule, which much exceeds the calyx in length, each open by four or five teeth at the apex, the outer wall of the fruit contracting more in drying than does the inner one, so that these teeth become reflexed; and the seeds are rough with minute tubercles but with an orbicular smooth flange or wing surrounding each of them.

A remarkable variety occasionally occurs in which the monosymmetric flower has regained its polysymmetry by developing five spurs, one to each petal, five equal stamens, and a circular mouth to the corolla-tube surrounded by five reflexed lobes. Linné termed this variety *Peloria*, from the Greek *πέλωρ*, *pelor*, a prodigy.

CCLII.—THE IVY-LEAVED TOADFLAX.

Linaria Cymbalaria Miller.

FEW botanists would deny the indigenous character of the Common Yellow Toadflax (*Linaria vulgaris* Miller). Most species of the genus, however, produce a profusion of seed which is jerked out of their capsules by gusts of wind and often carried farther than it otherwise might be by means of its wing-like margin. Natives, perhaps, originally of the dry, sunny lands of the south, these plants, in their seedling state, can withstand so much parching sun that they grow up—flower and fruit—in summer cornfields or spread from cornfields to bare railway-banks or dry roadside wastes.

Thus it comes about that, of some fourteen other species of the genus recorded in England, one only—the beautiful Pale Blue Toadflax, inaptly named *Linaria repens* Miller—escapes the pillory of Mr. Dunn's "Alien Flora." Though it has a perennial creeping rhizome, this rare species sends up slender erect stems, bearing its beautiful little pale lavender, purple-veined blossoms on calcareous soils, especially near the sea, still growing in some spots where it was recorded by Ray in the seventeenth century.

Of the rest some are mere casuals. *L. purpurea* Miller and *L. Pelisseriana* Miller, ornamental plants from southern Europe, have escaped from cultivation on to old walls and waste ground : *L. bipartita* Willdenow, from the same region, has occurred where grain has been thrown as food for pheasants : *L. chalepensis* Miller has appeared near corn-mills : *L. supina* Desfontaines, which seems wild in Normandy, has occurred on ballast : and *L. parviflora* Desfontaines and *L. triphylla* Miller, cornfield weeds of the Mediterranean area, have been found on waste ground here. The North American *L. canadensis* Dumont de Courset is clearly an introduction ; and the Mediterranean *L. spartea* Hoffmansegg and Link has only succeeded in maintaining itself for a few years. Others, however, longer and more firmly established, are mentioned in many Floras as if indigenous. *L. viscida* Mœnch, for example, with sticky leaves and palest lilac flowerets, native to rocky ground in southern Europe, occurs as a cornfield weed on chalky or sandy soils and sometimes spreads to waste ground : *L. spuria* Miller, the *Female Fluellen* of Gerard, so named, probably, from the Dutch *fluweelen*, velvety, with ovate leaves and purple and yellow flowers, also a native of the Mediterranean region, seems to have been an introduction with corn ; as also is the nearly allied *L. Elatine* Miller, with hastate leaves, which is more frequently found as a cornfield weed than the previously named species.

More beautiful than most of these, and probably more recently introduced than the three last named, is the Ivy-leaved Toadflax (*L. Cymbalaria* Miller).

The following account by Parkinson (1640) contains the first reference to it as growing in England :—

"Cymbalaria Italica Hederacea. The Italian Gondelo or Ivie-like leafe.

"This small herbe creepeth on the ground with slender threddy branches all about, taking hold on walls or any thing it meeteth, by small fibrous rootes, which it shooteth out at the 'oynts as it runneth : at the severall joynts grow small broad,



THE IVY-LEAVED TOADFLAX—continued.

and almost round leaves, cut in on the edges into corners, somewhat like unto a cornered Ivie leafe, each standing upon a very small and threddy stalke : at the joynts likewise stand severall small flowers upon slender footestalkes, fashioned like unto a Snapdragon or Fluellen flower, with a taile or spurre behind it, mixed of yellow whitish and purple colours, and the spurre as it were washed over with a purplish also ; in whose places after they are fallen come small round heads, containing small blackish seede. . . It groweth naturally in divers places of our Land, although formerly it hath not beene knowne to bee but in Gardens, as about *Hatfield* in *Hartfordshire*, . . as also upon the thatched houses in the North parts, as I am given to understand, and most abundantly in Lancashire, and in my Garden where it runneth up from the ground on the wall a pretty height. . . It flowreth seldome untill the end of July . . . but continueth with mee in flower untill the great frostes destroy it. . .

“This never as I thinke met with a Greeke Author to give it a name, although the name *Cymbalaria* by the Latines is derived from the Greeke word κύμβα, *Cymba*, a boat ; or from the herbe κύμβαλιον, *Cymbalion*, which *Dioscorides* saith was a name given to his *Cotyledon*, or *Umbilicus Veneris* alter . . . and thereupon gave it the name of *Cymbalaria*. . . *Lobel* calleth it *Cymbalaria Italica hederaceo folio*, and *Columna Linaria hederæ folio* ; for he in this as in all other herbes saith, the flowers and seede doe most truly demonstrate the *species* of every *genus*, which I hold to be the best judicium an Herbarist can use.”

Parkinson alludes later to the use of the leaves of the plant as salad in Italy.

Dillenius, overlooking this passage, thought that the Chelsea Physick Garden, founded in 1673, was the first place from which this little Italian plant escaped ; and William Curtis, a century later, says that near London

“seeds are carried by the flux and reflux of the tide up and down the river, and left at high-water mark in the crevices of old walls, where they take root and increase very fast.”

Baxter calls the plant *Oxford Weed*, because it is “abundant on almost every wall at Oxford” ; and among the many modern names that so charming a little plant has obtained, such as *Climbing Sailor*, *Creeping* or *Roving Jenny*, *Pedlar’s Basket*, and *Mother of Thousands*, that of *Kenilworth Ivy* would seem to have had a similar origin. Nowadays, at all events, it begins to flower earlier than the month mentioned by Parkinson, producing generally a succession of blossoms from May till November. An interesting physiological feature of the species is that the flower-stalk is at first positively phototropic, growing more slowly on the side towards the light, so that the flowers bend outward towards the light. After a pause in its growth, it recommences and is then—in the fruiting stage—negatively phototropic, growing more slowly on the outer side, so that the capsules are bent inwards towards the wall on which the plant grows and its seeds may find their way into any of its crevices.

CCLIII.—THE LESSER SNAPDRAGON.

Antirrhinum Orontium Linné.

AS we have seen, the genus *Antirrhinum* differs mainly from *Linaria* in having only a pouch-like swelling at the base of its anterior petal instead of a spur. Another general character is the dehiscence of the capsule, which usually consists of two unequal chambers, the posterior and smaller one bursting by a single pore, while the larger anterior one bursts by two pores.

The genus includes over thirty species, natives of the Northern Hemisphere, about equally divided between Europe and Asia. Some are annual, others perennial, and a few are shrubby or climbing plants. They have generally entire leaves and those lower on the stems are often in opposite pairs. Their flowers are often large and showy, the depth of the corolla-tube in some cases, such as the Common Snapdragons of our gardens (*Antirrhinum majus* Linné), compensating for the shallowness of the honey-pouch at its base. As in most species of *Linaria*, the two lips of the corolla tightly close the mouth of the corolla-tube, enclosing and protecting the essential organs, and only separating, with a spring-like movement, when considerable weight is applied. The broad prominent palate is bearded with hairs, as in *Linaria*, and has two projections at its base which fit into corresponding hollows in the upper lip and thus constitute a hinge. Children, probably from the earliest times to the present, have loved to pinch the blossoms between their finger and thumb and thus make them open and shut ; and Dr. Prior suggests that the popular name of the plant may be "Snap, dragon !" and not merely the "snap " or snout (German *schnabel*) of the dragon. Wide-mouthed snapping dragons were more familiar objects in the many pageants of former days than they are at present. This closing of the personate corolla serves, of course, to exclude small honey-robbing insects, cross-pollination in this group being entirely the work of bees. The four stamens lie in pairs along the upper lip of the corolla, the anthers of the two longer ones being in front. They thus dust the back of the bee with their pollen as he enters the flower. The honey is, as is usual in the Family, secreted at the base of the ovary ; and anthers and stigma mature simultaneously.

The name Ἀντιρρόινον, *Antirrhinon*, from ἀντί, *anti*-, against, ῥῖν, *rhin*, the nose, occurs in Theophrastus, and probably refers to the mask-like flower, as do most of the various popular names, such as Gerard's *Lion's snap*, and the *Dog-mouth*, *Rabbit's Mouth*, *Tiger's Mouth*, and *Toad's Mouth*, which have also been used. In the celebrated fifth-century codex of Dioscorides at Vienna there is a rude but unmistakable figure of the Common Snapdragon (*Antirrhinum majus* Linné) under the name Κυνοκεφάλιον, *Kunocephalion*, Dog's head, which, no doubt, has also the same significance. Valerius Cordus, however, a commentator on Dioscorides, who died of fever before he was thirty, in 1544, writes :—

"Antirrhinon fructum fert vitulino capiti similem, tam exquisita similitudine, ut etiam os et nares appareant."
 "Antirrhinon bears a fruit like a calf's head, with so perfect a resemblance that even mouth and nostrils may be seen."



THE LESSER SNAPDRAGON—continued.

This statement is illustrated by a figure, or, as Dr. Prior terms it, a caricature, of the seed-vessel, which certainly bears a most extraordinary likeness to a calf's skull. None of Cordus's writings, however, were published until seventeen years after his death, when, in 1561, Gesner edited them. Meanwhile Turner, in his "Names of Herbes" (1548), writes:—

"antirrhinon groweth in many places of Germany in the corne fieldes, and it maye be called in englishe calfe snoute."

Turner, however, was an intimate friend of Gesner, whom he had visited at Zurich before this date, and he may well have seen Cordus's works before they were published. Few seem to have been as much struck by this likeness in the capsule compared to those who see likenesses in the flower, though Sir J. E. Smith does say of the fruit of the Lesser Snapdragon (*A. Orontium* Linné) that "when nearly ripe it resembles the face of a Monkey, or Bat."

The Great Snapdragon (*A. majus* Linné) occurs on old walls and chalk cliffs; but has no claim to be considered indigenous in Britain. It is perennial and has glabrous lanceolate leaves; racemose flowers on stalks pubescent with glandular hairs; and very short blunt sepals. Its flowers are crimson, white, or yellow, and it is interesting to notice how the red colouring-matter in the red-flowered varieties suffuses the whole plant, stem, and leaves as well as petals. Darwin states that the red-flowered form is self-sterile, *i.e.* will not set seed with pollen from the same flower; but the white variety only partially so. These deep flowers are mainly pollinated by humble-bees, though the honey-bee pushes open the lips of the corolla to collect the pollen without actually entering, and both it and various species of humble-bee sometimes bite through the base of the corolla and thus rob the flower of its nectar without effecting pollination. Almost all the *Antirrhinums* in our gardens are varieties of *A. majus* Linné.

The pretty little Lesser Snapdragon (*A. Orontium* Linné), the subject of our Plate, has more claim to be considered a native of England. It is a cornfield weed, but is not common; and it occurs under similar conditions over most of the North Temperate Zone. It is generally an annual, though sometimes biennial, and branches freely from the ground, but seldom exceeds a foot in height. Its leaves are linear-lanceolate and about two inches long; and the upper part of the plant is generally slightly hairy, with the long viscid, glandular hairs which in this group so usually serve to keep small insects from the flowers. The small blossoms are nearly sessile in the axils of scattered leafy bracts, so that they form a loose spike. The spreading linear sepals are as long as the corolla when the flower opens, but soon elongate to nearly twice its length. The corolla is rose-red, or very rarely white, and its small size enables the honey-bee to secure its nectar and pollinate it. The three pores of the capsule each open with a lid. It is a flower of late summer.

CCLIV.—THE WATER FIGWORT.

Scrophularia aquatica Linné.

THE genus *Scrophularia*, from which the Family *Scrophulariaceæ* takes its name, is a group of striking, singular, though not, perhaps, beautiful plants. It comprises upwards of a hundred species, natives of the North Temperate Zone, chiefly in the Old World. They are mostly perennial herbaceous, or slightly shrubby, plants, and generally have a fetid smell, especially when bruised.

Though one species, *Scrophularia vernalis* Linné, which is classed, but on slight grounds, as a British plant, is of a bright green, with yellow flowers suggesting its allies the *Calceolarias*, the other forms which are found in this country are commonly suffused with a dark brownish hue. Turner, in his "Herball" (1551), says "the Duche men name it Braunwurtz," and himself proposes *Brownwort* as an English equivalent; while Cole, a century later, expressly and probably rightly explains that this is "from the colour of the stalke." Dr. Prior, however, goes out of his way to suggest as more probable that it is "from its growing so abundantly about the *brunnen* or public fountains of German towns." No doubt the interesting name *Brennet*, only recorded by Messrs. Britten and Holland from Somerset, and Lyte's *Brown net*, probably a corruption of this old diminutive form, have the same origin.

The rhizome in one species, *S. nodosa* Linné, is "beset with fleshy knobs," and it was these knobs which gave the name *Figwort* to the group and suggested, according to the doctrine of signatures, that these plants were a remedy against scrofulous swellings—such as the "kernels" in the neck, from which we get the name *Scrophularia* and Gerard's *Kernelwort*.

The aerial stems are usually hollow, erect, somewhat stiff in their habit of growth, and more or less acutely four-angled. Sometimes, as is clearly seen in Mrs. Perrin's right-hand figure, representing the lower part of the Water Figwort (*S. aquatica* Linné), these angles are distinctly winged. Children strip the leaves off the stems of this species and scrape them across one another like a bow across a fiddle, whence we get the names *Fiddles* and *Fiddlewood* by which the plant is known in Lincolnshire and Yorkshire, and their Devonshire equivalent *Crowdy-kit*.

The leaves are mostly opposite, simple, and variously serrate or pinnately lobed. Those of the Water Figwort are crenate and blunt, and thus so resemble those of the Wood Betony (*Stachys officinalis* Franchet) that we can well understand Turner calling this species *Water Betony*. In his "Names of Herbes" he writes:—

"clymenum of Dioscorides, is water Betonie as I suppose called of some Herbaries Scrofularia maior . . . and . . . groweth euer in water sydes."

The primary branching of the tall inflorescences is racemose; but the lateral shoots are dichasial cymes. The individual flowers are small, with short, blunt calyx-lobes and a globular corolla with a bilobed, erect upper lip and a trifold lower



THE WATER FIGWORT—continued.

one, leaving the throat of the corolla open. In the dark species the upper lip is of a remarkable colour, varying from the dull crimson of coagulated blood to a chocolate or lighter brown, while the tube and lower lip are lighter, yellow, or greenish. In these species the flowers have an unpleasant smell which is, however, attractive to wasps—the main pollinating agency. The flowers are distinctly protogynous, and the stamens and style lie along the lower, instead of along the upper, lip. The fifth stamen, the posterior one, produces no pollen, its anther being replaced by a broad, kidney-shaped scale between the two posterior corolla-lobes.

“This,” says Lord Avebury, “is so well formed that I cannot help suspecting it has some function which has not yet been observed.”

In the first, or female, stage of the flower the stigma projects, while the anthers are immature. After the pollination of the stigma, the style curves downward and the anthers burst transversely. The fruit is a rounded, pointed, two-chambered capsule opening by two valves with inflexed margins.

The chief characters of the Water Figwort distinguishing it from nearly allied forms are the fibrous root ; the polished glabrous surface ; the winged angles of the stems ; the blunt crenate leaves, cordate at their bases ; and the narrow linear bracts below each pair of cymes. Other and very similar species frequent shady woods and comparatively dry situations ; but this species is distinctly a waterside plant. Its name of *Stinking Christopher* may, therefore, contain an allusion to the legend of St. Christopher, the fearless giant ferryman. The tall flower-spikes contribute an effective element to many a waterside landscape ; but, though succulent when alive, they are so tough and rigid when dead as often to prove very troublesome to the angler, his lines becoming entangled in the withered fruit-stalks.

CCLV.—THE YELLOW MONKEY-FLOWER.

Mimulus Langsdorffii Donn.

OF the many delightful chapters that Mr. W. H. Hudson has given us from "The Naturalist in La Plata" down to his latest volume, I know of few more pleasing than that final one in "Hampshire Days" in which he discourses of yellow flowers and naturalisation with *Mimulus Langsdorffii* as a text. We sympathise with him when he exclaims :—

"What, we should like to ask of our masters, is a British wild flower? Does not the same rule apply to plants as to animals—namely, that when a species, whether 'introduced' or imported by chance or by human agency, has thoroughly established itself on our soil, and proved itself able to maintain its existence in a state of nature, it becomes, and is a British species?" . . . "going farther back in time, it may be said that every species has at some time been brought, or has brought itself from elsewhere."

We can understand his association of many

"weedy-looking plants of unpleasant odour which in late summer produce yellow flowers—tansy, fleabane, ragwort, sow-thistle,"

though we may not share his distaste for St. John's-wort or Yellow Loosestrife. Still more can we appreciate his enthusiasm for that

"other conspicuous yellow waterside flower . . . which became more and more abundant as the season advanced, while the others, one by one, faded and failed from the earth, until, during the last half of September, it was in its fullest splendour."

The genus *Mimulus* comprises some sixty species of herbaceous plants, natives of the extra-tropical lands of America and—to a less extent—of the continents bordering on the Pacific and Indian Oceans. They have square stems; opposite, simple leaves; and generally solitary, axillary flowers. The calyx is tubular, five-angled, and five-toothed; and the corolla has a cylindrical or funnel-shaped tube with two widely-gaping reflexed lobes. There are four didynamous stamens, maturing simultaneously with the stigma, which consists of two sensitive lobes; and the loculicidally two-valved capsule discharges a number of minute seeds.

Several of the species have been for a considerable period in cultivation in our gardens, and Linné's name for the genus is said to refer to some supposed resemblance in the form of the flower to a monkey, being a diminutive from *μῖμῶ*, *mimo*, an ape or mimic, whence too the popular name of *Monkey-flower*. The cottage favourite *Mimulus moschatus*, with trailing stems, woolly leaves, small yellow flowers, and a musky perfume, was brought by David Douglas from the Columbia River; but the true *M. luteus* Linné was a South American form with a narrower tube to its corolla than the plant now frequent by our watercourses and a more regular or polysymmetric less bilabiate limb.

The only species which has become generally naturalised in this country was brought dried from Alaska by Langsdorff about 1809: seed was grown on the Continent, and, in 1812, at Cambridge by James Donn; and he named it *M. Langsdorffii*. Varieties of it occur all along western North America from Mexico



THE YELLOW MONKEY-FLOWER—continued.

northward. It is a perennial, with branching prostrate, hollow stems sending up erect, leafy flowering branches from six inches to three feet in height. The leaves are opposite, ovate-oblong, coarsely toothed, from one to four inches long, with from six to nine radiating veins, the lower ones pinnate, the upper sessile and simple. The large yellow flowers are on slender peduncles among the upper leaves : they are from one to two inches long ; and have a green inflated calyx and very often a few crimson spots on the lower lip of the corolla. The style lies above the stamens, so that the stigma is first touched by an insect-visitor. The stigma consists of two divergent plates which are sensitive to contact, closing up like a forceps, and thus enclosing any pollen brought to them, while at the same time the pollen of the same flower, when carried out by the retiring insect, is precluded from access to the stigmatic surfaces. If caused to close by irritation without enclosing pollen, the stigmatic lobes reopen. The whole floral mechanism is adapted to the visits of bees.

We well remember when we first saw this beautiful plant in mid-stream in the Water of Leith ; its luxuriant growth as we traced it at another time up the pretty Carding-mill Valley at Church Stretton into the heights of the Longmynd ; and a single plant in the Mimram near Hertford that did not prepare us for the magnificent masses of it which line the banks of the Lea at Broxbourne.

“The form of stem, leaf, and flower,” says Mr. Hudson, “is a very perfect example of that kind of formal beauty in plants which is called ‘decorative.’ . . . But the shape is nothing, and is scarcely seen or noticed twenty-five to fifty yards away. . . . The colour is then everything. There is no purer, no more beautiful yellow on any of our wild flowers, from the primrose and the almost equally pale, exquisite blossom which we improperly name ‘dark mullein’ . . . to the intensest pure yellow of the marsh marigold.”

“But although purity of colour is the chief thing it would not of itself serve to give so great a distinction to this plant ; the charm is in the colour and the way in which Nature has disposed it, abundantly, in single, separate blossoms, among leaves of a green that is rich and beautiful, and looks almost dark by contrast with that shining, luminous hue it sets off so well.”

CCLVI.—THE SPEEDWELLS.

Veronica hederifolia Linné, *V. Tournefortii* C. G. Gmelin,
V. Chamædrys Linné, and *V. serpyllifolia* Linné.

WHILST *Verbascum* is structurally at one extreme of the Family *Scrophulariaceæ*, *Veronica* is at the other. The former is so nearly polysymmetric as to approach very nearly to *Solanaceæ*: the latter with its stamens reduced to two presents the maximum of monosymmetric modification in the Family.

Veronica is a large genus, having about two hundred species; and, whilst they are very uniform in their floral characters, they present a great series of diverse modifications in habit and in vegetative characters, according to the very varied conditions under which they live. Of the five united sepals the posterior one is generally suppressed: the corolla is generally violet or blue, indicative of a high degree of specialisation; and its two posterior petals are united in one flat member larger than either the two lateral ones or the anterior one which may differ in shape, size, and colour; so that the whole appears tetramerous and is thus only sub-rotate and slightly monosymmetric. Of the normal five stamens, not only the odd posterior one but also the anterior pair are suppressed, leaving only the two lateral ones; whilst the two united carpels form a capsule which is often compressed and few-seeded. Geographically the genus may be said to have two distinct areas of dispersion, about seventy-five of its two hundred species being European, while no less than sixty-four occur in New Zealand. The genus is in general extra-tropical, and many of its species are alpine. Some are annual; others perennial. Among our seventeen British representatives of the genus, two are polished glabrous aquatic plants: the two species figured to the left of our Plate, *V. hederifolia* Linné and *V. Tournefortii* C. G. Gmelin, are annual weeds in cultivated ground; and the majority of the remainder, like the two others here drawn, *V. Chamædrys* Linné and *V. serpyllifolia* Linné, are somewhat wiry little perennials, often downy and adapted to dry, sunny situations. Most of the New Zealand species are shrubby: some are small trees; and most of them are distinctly xerophytic, with their leaves either thick and leathery or so reduced to adpressed scales that their branches strikingly resemble a Cypress or a Club-moss.

The euphonious generic name *Veronica*, given by Fuchs, is taken apparently from the name of the holy woman who is said by an ancient tradition to have received the impress of Our Lord's wounded face on a napkin; but the etymology of the name is doubtful, the choice seemingly lying between the barbarous mixture of the Latin *vera*, true, with the Greek *εἰκών*, *eikon*, an image, and a corruption of *ἱερά*, *hiera*, holy, and *εἰκών*, *eikon*, or simply of the name Berenice. Less doubtful is the origin of the most general English name for the group. The fugacious corollas, falling almost directly the flower is gathered, suggested the parting greetings *Forget-me-not*, *Remember me*, *Wish me well*, and *Speedwell*, an old equivalent for



THE SPEEDWELLS—continued.

Good-bye or Farewell ; and this last remains in general use, though not for cultivated species.

The blue corollas often lined with darker tints, as is the iris of the eye, have suggested *Bird's-eye* and *Cat's-eye* as names for several species ; but most of the popular terms of endearment and admiration belong, as might be expected, to our most beautiful species, *V. Chamædrys* Linné. Though now, perhaps, most often *Germander Speedwell*, the first half of which is, as we have seen, from the Greek *χαμαιδρυς*, *chamaidrús*, ground-oak, from the form of the leaf, through the French *gamandrée*, *Blue Eye*, *Eyebright*, and the modern *Angel's-eye* and *Blue Stars* are among these tributes of affection. *Veronica* is general in the languages of the south—Italian, Spanish, and Portuguese ; and even occurs as *Weronyka* in Russian and Czech : *Honour-and-praise* is the literal rendering of the pretty German tribute ; and Ruskin appreciatively writes :—

“ Medicinal to soul and body alike is this gracious and domestic flower.”

Of the species here represented—taking them in order from left to right—*V. hederifolia* Linné, common in cornfields, is known as *Corn Speedwell* and *Mother of Wheat* : springing up from seed early in the year, it is the *Winter-weed*, or less complimentarily *Botherum* ; while its lobed leaves give it the names of *Ivy-leaved Speedwell*, *Hen-bit*, and *Morgeline*, the last being said to be the French *morsgeline*, the Latin *morsus gallinæ*, bite of a hen.

The more ornamental annual weed *V. Tournefortii* Gmelin seems only to have reached this country in the third decade of the nineteenth century, though now it is found everywhere. Its stalked, ovate, serrate leaves, hairy stems, and handsome flowers, solitary in the axils, on slender stalks, bright blue and as large as those of the Germander Speedwell, are now familiar ; and we are pleased that its earliest name commemorates the great French botanist Tournefort, rather than the comparatively obscure Buxbaum, after whom it was once named.

Had we much more space we could not do justice to the beauty and interest of that wayside delight, *V. Chamædrys* Linné. Two lines of delicate hairs down each internode shift their direction at every node. The flowers are massed in axillary racemes : dark blue lines on the petals lead to the nectar, which is protected by hairs ; and flies clasping the two divergent stamens dust the under surfaces of their bodies with the pollen.

The Thyme-leaved Speedwell (*V. serpyllifolia* Linné), with pubescent stem and glabrous, ovate, slightly crenate, and leathery leaves, is one of the species in which the flowers are in a terminal raceme. Individually they are small and pale.

CCLVII.—THE FOXGLOVE.

Digitalis purpurea Linné.

IT is certainly not easy to realise a near affinity between our modest blue-flowered Speedwells with their sub-rotate corollas and two stamens and the lordly red or yellow bells of the Foxgloves with the four stamens so much more general in the Family. Some systematists, however, place the two genera *Veronica* and *Digitalis* in close proximity to one another.

The genus *Digitalis* contains but few species and is of a comparatively limited geographical range. Some twenty-two species in all, mostly belonging to the Mediterranean region, have representatives in western Asia, North Africa, and the Canary Islands ; but only one, our Common Foxglove (*Digitalis purpurea* Linné), extends to Britain or Scandinavia.

They are tall biennial or perennial herbs, only one or two species becoming shrubby : their leaves are simple and scattered, the lower ones stalked and crowded in a rosette ; and the numerous flowers are in terminal bracteate racemes, which generally become one-sided by the twisting of the flower-stalks. The persistent calyx is deeply divided into five lobes of which the posterior one is the narrowest, suggesting an approximation to the suppression of this sepal in *Veronica* ; and the large sub-campanulate corolla, which may be crimson, yellow, tawny, or white, is contracted above the ovary into a lower honey-containing tubular portion, expanding above into unequal shallowly-cut lobes, the posterior one recurved and notched, the anterior longer. The didynamous stamens are included, and are arranged, as in *Linaria* and *Antirrhinum*, against the posterior or upper side of the bell, and their anthers mature before the bilobed stigmas do so. Honey is secreted by a ring-shaped nectary below the ovary ; and the interior of the corolla-tube is generally marked with coloured spots and rings like those on a leopard, and is also furnished with hairs. While the spots almost certainly act as honey-guides, the function of these hairs is a matter in dispute, it having been variously suggested that they serve to exclude small creeping insects, or as foothold for the larger and more desirable visitors, or for both these purposes. The pendulous position of the flowers is a protection for the pollen and the honey against rain, and their general structural characters are certainly adapted to the visits of humble-bees. The two-chambered capsule splits septicidally and discharges an immense number of minute angular seeds.

The name *Digitalis*, from the Latin *digitale*, a glove, was given to these plants by Fuchs in 1542, with the remark that up to that time there was no name for them either in Greek or in Latin. As, however, the names *Foxes-glofa* and *Foxes-glove*, with the French synonym *Gauntelée*, occur in vocabularies of the tenth, eleventh, and thirteenth centuries, Sir J. E. Smith's ingenious suggestion that our popular name is derived from *Digitalis Fuchsii* falls to the ground. The sight of these beautiful hanging carillons of crimson bells among the fern in woodland glades naturally



THE FOXGLOVE—continued.

inclines the etymologist to substitute *Folks'* for *Fox* ; but there is not much evidence for the antiquity of such local names as *Fairies' Petticoats*, *Fairy Cap*, *Fairy Bell*, *Fairy Glove*, and *Fairy Thimbles*. Fuchs's name, its early English anticipations, the German *Fingerkraut* and *Fingerhütblume*, or Finger-plant and Glove-flower, the Danish *Rod fingerhüt*, Red Glove, the Dutch *Vingerhoedkruid*, Glove-wort, and the French *Gants de Notre Dame*, Our Lady's Gloves, seem to confirm one another as to the meaning of the latter part of our name *Foxglove*, though we still have in many lands such names as Bluidy bells, Glöckchen, Cloche, and the Norwegian *Reve bjelde*, Fox-bells, suggesting an alternative. There is also another Norse name *Reveleika*, Fox-music, which is strong evidence for a primitive English *Foxesgliew*, with the same reference to the Old English *gliew*, the *tintinnabulum*, or *ring-o'-bells*, the favourite musical instrument that we have in names borne by the Blue-bell and the Henbane. The warm dry, sandy heath or woodland shade where the *Digitalis* flourishes is just the place where Reynard would make his earth ; in fact, we have often seen Foxgloves growing hard by fox-earths, so that the association is, perhaps, as natural in ancient Norway or England as would be one with the fairy-folk. To complete our discussion of the many names borne by a plant which must always have attracted attention, it is only necessary to mention that, *Dock* meaning any large-leaved plant, the various names *Flop-dock*, *Flap-dock*, *Pop*, *Poppy*, *Poppers*, and *Pop-glove* are all alike derived from the favourite childish amusement of popping the corollas between their hands. The French equivalent *claquer*, to pop, gives us the name *Claquet* for the flower, a name still current in Guernsey.

Our species, *D. purpurea* Linné, is distinguished by its downiness ; its crenate, wrinkled leaves, the lower ones tapering into winged petioles ; and the ovate acute sepals. It is, according to Darwin, sterile if pollinated with its own pollen, so that it is not surprising that we have obtained an immense variety of seedling forms, many of which are of great beauty. White-flowered or flesh-coloured forms are sometimes found wild. The stately racemes of flowers of mingled varieties, tall as they are and tolerant of a good deal of shade, form a most excellent background in garden or shrubbery. They are not difficult to grow from seed and are not exacting as to soil, though undoubtedly preferring humus and refusing to grow in the presence of lime. Few plants are so unmistakably calciphobe as is our wild Foxglove. In Surrey it is abundant on the Bagshot Sands but stops abruptly at the outcrop of the Chalk, though growing where that formation is covered by a capping of Tertiary sands or Quaternary gravels. In East Gloucestershire, a limestone area, the plant is unknown save where the Midford Sands crop out in Frocester Park ; and similarly in North Wales one may see plenty of Foxgloves on the igneous rock about Deganwy, but not one on the limestone peninsula of Ormes Head.

The whole plant is dangerously poisonous from the presence of the alkaloid digitalin which has a very powerful action on the heart.

CCLVIII.—THE COMMON COW-WHEAT.

Melampyrum pratense Linné.

AS such genera as *Verbascum* and *Veronica* depart from the ordinary structural type of the *Scrophulariaceæ*, so there is a group of genera—nearly related among themselves—which depart from the ordinary physiological type of nutrition. That ordinary type is what we have termed *autophytic*—plants, that is, with a well-developed root-system by which they obtain their liquid food-material, with its dissolved mineral salts, from the soil, and well-developed green foliage-leaves, by which they obtain the gaseous carbon-dioxide they require, from the atmosphere. This aberrant type, on the other hand, which includes the Cow-wheats, Yellow and Red Rattles, Eyebrights, and Bartsias, is semi-parasitic. In this way it forms a transition towards the allied wholly parasitic Family *Orobanchaceæ*, just as *Verbascum* in floral structure forms a transition to the allied polysymmetric Family *Solanaceæ*. These semi-parasitic *Scrophulariaceæ* are mostly annuals and grow generally among grasses, becoming attached by suckers or haustoria on their roots to the roots of the grasses. The *Scrophulariaceæ* plant germinates and grows for some time in the manner of an autophyte independently. It forms green leaves of its own and can, therefore, supply itself with all the necessary ingredients of plant-food, though it will be noticed that these green leaves are generally small and certainly are so when compared to the number of flowers and fruits that the plant develops. The formation of the haustoria takes place in spring, and they are sometimes comparatively large, enveloping more than half the circumference of the root attacked. The transference of elaborated soluble food-material, such as sugar and peptones, begins at once ; and so rapidly is the material thus acquired utilised by the parasite in building up its structures, stems, leaves, flowers, fruits, and seeds, during spring and summer, that there is little or no storage of any reserve supply. By midsummer the part of the host-plant to which the parasite is attached may have been killed, and there is then an absorption of the products of its decay. At this season the haustoria sometimes store up starch and other insoluble reserve-material. With this method of nutrition may be connected the fact that the green parts of these plants, like the non-green parts of some wholly parasitic plants, turn black when pressed. The Cow-wheats growing in shady places often develop a good deal of red or purple colouring-matter in their leaves, especially in the upper ones ; and on one occasion, in a cornfield within the shadow of a copse, we noticed a plant in which this was markedly the case, whilst its roots were ramifying through some stable manure.

The genus *Melampyrum* consists of some twenty-five species of branched and spreading, annual, sub-glabrous herbs, natives of the Temperate regions of the Northern Hemisphere. Of our four British species, only *M. pratense* Linné, the species here represented, is at all general. Their stems are bluntly four-angled ; and their leaves, all of which are cauline, are opposite, narrow, and mostly entire. In



THE COMMON COW-WHEAT—continued.

M. pratense, however, and in some other species, the upper leaves, which serve as bracts to the solitary axillary flowers, are more or less toothed at the base. The flowers are, in some species, grouped in spikes ; but in other cases, as in the species here figured, they are solitary in the axils, but both those at each node are so bent as to face in one direction. The calyx is persistent and tubular, divided above into four long, narrow, unequal, acuminate lobes ; but it does not always suffice to protect the corolla-tube from being bored by intelligent honey-bees which are unable otherwise to reach the honey. The corolla has a long tube, oblong in section, slightly dilated above, and the limb is divided into two lips, the upper one short, vaulted, compressed, and truncate, with a narrow reflexed border at each side, and the lower divided into three sub-equal obtuse lobes and having a prominent palate. The anthers of the four epipetalous stamens converge under the upper lip, so touching by their edges as to form a *pollen-box* in which the pollen is dry and powdery, as in wind-pollinated flowers. At the lower end of each anther-chamber is a stiff point with which a bee visiting the flower must come in contact, thus unlocking the pollen-box and receiving a shower of pollen. This is known as the *loose-pollen mechanism*. If insect visits do not occur, the anthers fall apart and self-pollination may apparently take place. Lord Avebury pointed out that, whereas in most flowers the secretion of nectar ceases when the flower fades, *i.e.* immediately after pollination, this is not the case in *Melampyrum*, so that ants are attracted to the plant when the one or two seeds in each chamber of the loculicidal capsule are already fully formed. Lundström pointed out that these seeds, which are oblong, smooth, and white, with a black hilum at one end, closely resemble the chrysalis of the common ant and are constantly carried off by the ants to their nests by mistake. As it has well been said :—

“The ants go to feast on the cow-wheat honey : after dinner they are less wideawake than usual : they see what look like cocoons : they wonder how on earth they got there : what can be done, however, but take them home ? Once placed among the cocoons, it requires a better eye than an ant has to distinguish . . . In the excitement of flitting when the nest is disturbed, the mistake is repeated, and the seeds are also saved. It really seems a huge joke. If Nature could laugh, she would laugh at herself. The trick, like all other tricks, is found out some day ; for the seeds, like the cocoons, awake out of sleep. The awakening displays the fraud. When they begin to change the ants take no more notice of them, but next year their successors are done again.”

In the fine tilth of the ant-hill the seedling Cow-wheat finds most favourable conditions for beginning its life.

It was, no doubt, the resemblance of the seeds to grains of wheat that first gave the plants their popular name of *Cow-wheat*, the prefix being, perhaps, merely a contemptuous indication that they were useless for human food. Linné, however, says that cows are fond of the plant and that the best and yellowest butter is made where it abounds. The name *Melampyrum*, from the Greek μέλας, *melas*, black, and πυρός, *puros*, wheat, is supposed to refer to the notion that the presence of the seeds of these plants in flour made the bread black.

CCLIX.—THE DWARF RED RATTLE.

Pedicularis sylvatica Linné.

THOUGH some species of the Eyebrights (*Euphrasia*), the Yellow Rattles (*Rhinanthus*), and the Bartsias live in decidedly dry pastures, the genus *Pedicularis*, and certainly our two British species (*P. palustris* Linné and *P. sylvatica* Linné), are characteristic of moist ground. *Pedicularis* is a large genus, comprising, as it does, some 250 species. They are mostly natives of the Northern Hemisphere and many of them are alpine. Our own Dwarf Red Rattle (*P. sylvatica* Linné), for instance, has the stunted wiry habit and the disproportionately large and brightly coloured flowers characteristic of alpine. Like many other northern alpine genera, *Pedicularis* extends along the mountains into South America. It is interesting also to note that where, in a few cases, the genus extends into Arctic regions beyond the distributional limit of the humble-bees—the usual agents in the pollination of its species—the flowers develop shorter corolla-tubes so as to be adapted to pollination by flies. There are upwards of forty European species; but Mr. E. H. Wilson states that there are a hundred in the alpine meadows of western China at altitudes between 11,500 and 16,000 feet. In Britain there are only the two species above mentioned. Most species in the genus are herbaceous but perennial, though some of them, such as *P. sceptrum-carolinum* Linné, or Charles's Sceptre, named in honour of Charles II of Sweden, attain a height of three or four feet. Their leaves are variously arranged and are pinnately lobed or divided, with the exception of the few first formed at the base of the stem. The flowers are in bracteate spikes or racemes, with a swollen tubular or bell-shaped calyx, split in front and divided above into from two to five unequal, leafy, jagged segments. The corolla may be red, purple, yellow, or white; and has a cylindrical or dilated tube and two widely-separate lobes to the limb, the posterior one erect, vaulted, compressed, and notched, the anterior one deeply divided into three blunt lobes. The four anthers are concealed under the hood of the corolla and are so locked together with hairs as to form a pollen-box, much as in *Melampyrum*, and mature at the same time as the stigma; but the style following the curvature of the back of the corolla is bent at its apex, and the stigma protrudes from the hood and is so placed and protected that self-pollination seems to be prevented. The few angular seeds in the lower part of the loculicidally two-valved capsule, which splits from above downward, rattle when ripe, whence the plants have obtained their English name *Red Rattle*.

These plants seem to share the acrid sourness of the inadequately drained soil in which they flourish; and consequently they are not eaten by cattle. Like the related genera, they turn black in drying. The poverty of the pasture in which they occur, caused in part by their parasitism upon its grasses, or the presence in these swamps of entozoa productive of a diseased condition in cattle, has led to a charge against these plants of producing lice in sheep. This was the origin of Tragus's



THE DWARF RED RATTLE—continued.

name *Pedicularis* and its English equivalent *Lousewort*. On the other hand, the abundant honey in the corolla-tubes, secreted by a ridge below the ovary, has given the prettier names *Honeysuckle* and *Suckies* among children in districts as far apart as Ayrshire and Hampshire; while the large pink blossoms of the dwarf species, rising direct from the surface of peaty bog-land or from among its own tufts of moss-like pinnate leaves, have in Cheshire received the name *Moss-flower*.

Of the two British species, the taller, *P. palustris* Linné, is more decidedly a marsh plant. It rises stiffly in a pyramidal form above the surrounding vegetation, reaching a height of from six to eighteen inches, though it is an annual. It is nearly glabrous and its angular stem and the branches are alike commonly deeply tinged with red. There is a whorl of ovate, acute leaf-scales at the base of the stem, and the cauline leaves are partly opposite and partly scattered, bipinnatifid with obtuse pinnules, and bright green. The arrangement of the branches follows that of the leaves, those towards the summit of the main stem being scattered. The ovoid calyx is pubescent, ribbed, and divided into two main lobes which are unequally toothed, and it is tinged with red. The corolla is a dull red and its upper lip has a short truncate beak with a triangular tooth on each side.

The Dwarf Red Rattle (*P. sylvatica* Linné), common on moist upland heaths, is a perennial. Its thick, fleshy, slightly-branched tap-root is surmounted by a whorl of small crenate undivided leaves, and branches are given off from the base and lie prostrate on the ground. The leafy erect stems are generally only about three inches, or at most ten inches, high. The pale green angular calyx is glabrous and divides above into five irregularly-divided, leafy lobes; and the corolla is a bright pink. The corolla-tube is from ten to fourteen millimetres deep and is contracted into a very narrow passage just below the throat. The hood is compressed and so closed that the stigma projects through a narrow fissure and must be first struck by the humble-bee alighting on the labellum. Stout hairs on the filaments of the posterior pair of stamens serve to press together the anthers of the shorter anterior pair. In order to reach the honey, the visiting bee is compelled to dilate the hood, separating the anthers and receiving a shower of pollen; whilst the little projecting teeth on the inner edges of the reflexed margin of the hood serve to prevent the stigma from receiving any of the pollen of the same flower from the body of the bee in the course of the egress of the insect.

CCLX.—ANALYTICAL DRAWINGS OF THE NIGHTSHADE AND FIGWORT FAMILIES.

(*Solanaceæ* and *Scrophulariaceæ*.)

THE two Families of which representative genera are here analysed, the Nightshade Family (*Solanaceæ*) and the Figwort Family (*Scrophulariaceæ*), are more closely allied than appears to the general observer. We naturally associate in our minds the idea of monosymmetry with a Family that includes Figworts, Foxgloves, Snapdragons, and Speedwells, without thinking for the moment of the Mulleins. On the other hand, a flower like that of the Woody Nightshade suggests perfect polysymmetry ; and in thinking of the Family *Solanaceæ* we do not remember a certain general monosymmetry in the flower of the Henbane, nor the oblique position of the two carpels which is characteristic of the whole Family. This last-mentioned character—the fact that the plane passing through the midribs of the two carpellary leaves is oblique to the median plane of the flower—is not easily recognised and cannot be seen from any of the dissections here given.

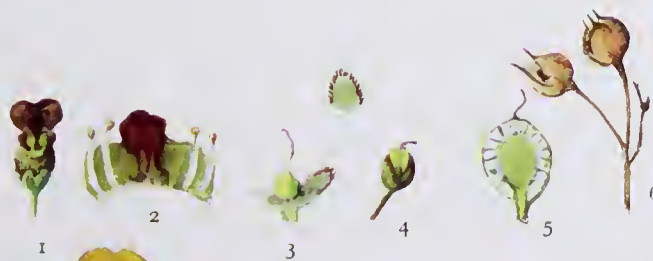
The first three lines of figures illustrate the *Solanaceæ*, the types chosen being the Deadly Nightshade (*Atropa Belladonna* Linné), the Henbane (*Hyoscyamus niger* Linné), and the Bittersweet (*Solanum Dulcamara* Linné).

Of the four figures in the first line, Fig. 1 is the calyx of *Atropa* seen laterally and of natural size ; Fig. 2 is the corolla opened so as to show the stamens and their insertion, somewhat larger than life ; Fig. 3 is the calyx and gynæceum, natural size ; and Fig. 4 is a cross section of an unripe but fully formed berry, showing plainly the two chambers, the central placentas, and the numerous seeds.

The second line of figures illustrates the Henbane (*Hyoscyamus niger* Linné). Fig. 1 is a longitudinal section of a flower in the median plane, slightly enlarged ; Fig. 2 is the fruit enclosed in the hairy calyx, of natural size. Fig. 3 is a capsule with the lid coming away, showing a placentation apparently similar to that of *Atropa* ; but the longitudinal section of the same, shown in Fig. 4, reveals the remarkable form of the placentas by which a very large seed-bearing surface is secured. Fig. 5 is an enlargement of one of the tuberculate seeds.

The third line of figures are those of the Bittersweet or Woody Nightshade (*Solanum Dulcamara* Linné). Fig. 1 is a flower, natural size, as seen from above ; Fig. 2, the essential organs, showing the anthers in a cone round the style ; Fig. 3, a petal with the “sham nectaries” at its base ; Fig. 4, an unripe fruit from below, showing the persistent calyx ; Fig. 5, a side view of the same ; and Fig. 6, a longitudinal section.

It is obviously the genus *Verbascum*, represented by the fourth line of figures, dissections of the Dark Mullein (*V. nigrum* Linné), which most strikingly illustrates the affinity between the two Families. Fig. 1 is a flower, seen from above, natural



ANALYTICAL DRAWINGS OF THE NIGHTSHADE AND
FIGWORT FAMILIES—continued.

size ; Fig. 2, part of the corolla dissected, showing the epipetalous insertion of the stamens ; Fig. 3, two stamens, enlarged, showing the purple hairs on their filaments ; Fig. 4, the calyx and gynæceum at an early stage ; and Fig. 5, the same later, both natural size ; and Fig. 6, a longitudinal section of the fruit.

The fifth line of figures represents the Yellow Toadflax (*Linaria vulgaris* Miller). Fig. 1 is a front view of the flower, of natural size ; and Fig. 2, a back view of the same, in which the calyx is seen. Fig. 3 is the corolla with the palate removed, so that the posterior lobe or hood is seen with the stamens indicated beneath it and the spur which belongs structurally to the front petal, most of which, with the two lateral petals, has been cut away. Fig. 4 is the gynæceum, soon after fertilisation ; Fig. 5, the same later ; and Fig. 6, in longitudinal section.

The sixth line of figures are those of the nearly related Lesser Snapdragon (*Antirrhinum Orontium* Linné), Fig. 1 being a flower as seen from behind, showing the long segments of the calyx. Fig. 2 is a side view of the corolla ; Figs. 3 and 4, the hood and two stamens, the bifurcation being better shown in the latter ; Fig. 5 is the gynæceum in the flower stage ; and Fig. 6, a longitudinal section at a later stage.

The seventh line illustrates the Water Figwort (*Scrophularia aquatica* Linné). Fig. 1 is a flower as seen from the front, natural size ; Fig. 2, the same so dissected as to show the four stamens ; Fig. 3, the gynæceum with part of the calyx, one of the rounded obtuse sepals with its brown membranous margin being shown above ; Fig. 4 is a young fruit ; Fig. 5, the same in longitudinal section, enlarged ; and Fig. 6, two ripe fruits of natural size.

The last line but one illustrates the Yellow Monkey-flower or Wild Musk (*Mimulus Langsdorffii* Donn). Fig. 1 is the corolla, so dissected as to disclose the four stamens, and showing also the spotted interior ; Fig. 2 represents two of the stamens ; Fig. 3, the calyx, style, and lamellar stigma ; Fig. 4, the gynæceum with the two stigmatic lamellæ closed ; and Fig. 5, a transverse section of the fruit, all the figures in this line being of natural size.

The last line of figures is devoted to the Germander Speedwell (*Veronica Chamædrys* Linné). Fig. 1 is the calyx, showing also the style ; Fig. 2—the corolla, stamens, and style—is reversed, the broad posterior union of two petals being below, the smallest anterior one above ; Fig. 3 shows one lateral petal and a stamen, slightly enlarged ; Fig. 4, the gynæceum, also enlarged ; Fig. 5, the calyx and young fruit, of natural size ; Fig. 6, a longitudinal section of the fruit, enlarged, showing the seeds ; Fig. 7, a ripe fruit with the calyx ; and Fig. 8, the dehiscence of the fruit, this being somewhat enlarged.

CCLXI.—THE LESSER BROOM-RAPE.

Orobanche minor Smith.

IN the numerous related genera of *Scrophulariaceæ* which are semi-parasitic we have an obvious transition to the closely allied Family *Orobanchaceæ*, the members of which are wholly parasitic. This transition is not merely in the physiology of their nutrition but also in their various structural characters, not all of which are obviously correlated with the parasitic mode of life. Thus not only have the *Orobanchaceæ* lost all, or nearly all, their chlorophyll, while their foliage is reduced to mere scales, the whole plant being thus of a dead brownish colour, but also their carpellary leaves are less rolled in at their margins, so that the ovary is one-chambered with parietal placentas, instead of the two chambers and central placentation of the *Scrophulariaceæ*. In this and other characters the *Orobanchaceæ* have much in common with the Tropical Family *Gesneraceæ*.

The *Orobanchaceæ* are not a large Family, only including about twelve genera with one hundred and fifty species in all, ninety of which belong to the genus *Orobanche*. They are chiefly natives of the Warmer Temperate regions of the Old World, a few of them advancing into the Tropics and into America. Six genera and ninety species are recorded for Europe, two genera (*Orobanche* and *Lathræa*) and ten species for Britain.

They are all herbaceous root-parasites, destitute of true foliage-leaves, and mostly perennial. The tuberous underground stem which is often present gave the Latin name *Rapum genistæ*, Turnip or Rape of the Broom, the English name *Broom-rape* being used by Henry Lyte in 1578. Parkinson in 1640 gave an admirable figure of one of them on the roots of the Petty Whin (*Genista anglica* Linné). Their parasitic nature had, however, been recognised from the earliest times, as is evidenced by Theophrastus's name ὀροβάγχη, *Orobanche*, from ὄροβος, *orobos*, vetch, and ἄγχειν, *anchein*, to strangle, literally translated by Turner and Gerard as *Choke-fitch* or *Orobstrangler* and *Strangle-tare*. It is interesting to notice in this connection that the ancient Greek botanists sometimes relied more upon observation and less upon guesswork than their sixteenth-century commentators, and that William Turner, "the Father of English Botany," was no mere literary commentator. In her admirable "Herbals," Mrs. Arber writes:—

"Turner had a fine scorn for any superstitious notions he detected in the writings of his contemporaries, and seems to have been particularly pleased if he could show that in any disputed matter they were wrong, while the ancients, for whom he had a great reverence, were right. For instance, he has a great deal to say about a theory, held by Mattioli, in opposition to the opinions of Theophrastus and Dioscorides, that the Broom-rape (*Orobanche*) could kill other plants merely by its baneful presence, without any physical contact. He declares that this view is against reason, authority and experience, and points out that the figure which Mattioli gives is faulty, in omitting to show the roots, which are the real instruments of destruction. He triumphantly concludes: 'And as touchynge experience, I know that the freshe and yong Orobanche hath commyng out of the great roote, many lytle strynges . . . wherewith it taketh holde of the rootes of the herbes that grow next unto it. Wherefore Matthiolus ought not so lyghtly to have defaced the autorite of Theophrast so ancient and substantiall autor.'"

As is generally the case with parasites, a great number of seeds are produced, though they are as simplified or reduced by what we term anticipatory inheritance, as



THE LESSER BROOM-RAPE—continued.

are those of the Dodders. Small as they are, they contain a large supply of albumen, but the embryo is a mere thread-like axis without cotyledons. The shoot end remains in the seed to hand on the reserved food, while the root end works its way spirally through the soil. If it does not meet with a suitable host-plant it perishes ; but, if it does, it adheres to it, thickens and sends out haustoria into it, at the same time forming a lateral bud which grows out into the short, thick rhizome. The different species vary apparently as to the plants upon which they will grow. Thus *O. Hederae* Duby grows only upon the roots of Ivy, *O. rubra* Smith upon Wild Thyme, and *O. major* Linné upon various shrubby leguminous plants, such as Broom and Gorse. *O. minor* Smith is most commonly found on Clover, to which it is often very destructive, so that in modern times it has earned among Kentish farmers the uncomplimentary names of *Devil's-root* or *Hell-root*. We have, however, cultivated it on *Primula sinensis*, *Azalea pontica*, and *Pelargonium inquinans*.

From the short underground stem a many-flowered scape with a somewhat fleshy axis is rapidly formed, the flowers being, in most species, sessile in the axils of narrow brown bracts. The calyx in most British species is divided into two bifid lobes and persists in the fruit stage, as does also the tube of the corolla. The whole flower is markedly monosymmetric to the median plane, the corolla being usually arched and divided above into two gaping lips, and tinged with purple, the upper lip or hood being two-lobed and the lower divided into three spreading lobes. The didynamous, epipetalous stamens are included : the filaments are dilated and hairy at the base ; and the anthers split longitudinally. The stigma is bilobed and generally projects beyond the anthers, much as in *Pedicularis*, the arrangement being a loose-pollen mechanism similar to that in the semi-parasitic *Scrophulariaceæ*. The species differ as to the presence or absence of honey and perfume, honey, when present, being secreted by a hypogynous disk. The capsule splits into two valves ; but these very often cohere both at their base and at their apex, the many, minute, wrinkled, or tuberculate seeds falling out by degrees between them.

Most of the Orobanches are bitter, acrid, and astringent ; but, though formerly in repute, none is now employed medicinally.

CCLXII.—THE TOOTHWORT.

Lathræa Squamaria Linné.

NO more marvellous life-story exists in the whole realm of plant physiology than that which is told of the Toothwort (*Lathræa Squamaria* Linné). Every aspect of the plant is bizarre, from the first moment when we see its fleshy translucent scales pushing up through loose earth and dead leaves—like some compound Ascidian modelled in paraffin-wax—to the appearance of the interior of the scales and their wonderful glands under the microscope. Only a faint tinge of pink suffusing the incurved flower-spikes and deepening into a dull purple in the corolla suggests that the pallid plant is alive.

The plant is a perennial and grows in humus at the foot of Elm, Hazel, Beech, or Linden trees, on the roots of which it is parasitic. It has a thick, freely branching, fleshy, cylindrical rhizome, sometimes nearly a foot in length, giving off slender rootlets, and thickly beset with white fleshy, tooth-like scales in opposite and decussate pairs, thus giving a quadrangular outline to the whole shoot. These scales have earned for the plant such obvious names as the *Dentaria* of Mattioli, translated as *Toothwort* by Gerard, and the *Squamaria*, from the Latin *squama*, a scale, used generically by Rivinus and Haller and perpetuated as a specific name by Linnæus. The rootlets swell out into tubercular bases at their points of attachment to the tree-roots, so that there is no doubt that the plant's nutrition is, in part at least, that of a root-parasite, like its allies the Orobanches.

It is round the scale-leaves on its rhizome that the main interest of this remarkable plant is centred. Though ending above in a blunt point these scales are in reality bent back upon themselves, much as are those of such xerophytes as the Crowberry (*Empetrum nigrum* Linné), so that a hollow cavity, branching out irregularly into from five to thirteen lateral spaces with wavy outlines, is formed in the interior of each scale, only communicating with the exterior by a narrow slit at the base of the lower surface of the scale. The inner surface of this cavity, which seems to us to be the structural equivalent of the under surface of the leaf, is thickly set with glands of two kinds, sessile and stalked, which strikingly recall those on the leaves of the Butterwort. The sessile glands are relatively large flat domes, made up of from two to four cells each : the stalked ones each consist of two rounded cells side by side on a common stalk, consisting of a single cell. Many small subterranean animals—mites rather than insects—enter these cavities, and Lord Avebury points out that this is a general habit with all such animalculæ in search of food or shelter. It seems also certain that the reaction of the interior of these cavities is acid. It is further stated by various observers that both kinds of glands emit hyaline threads. These have been variously described as protoplasmic, waxy, or bacterial in nature, and it has been very circumstantially related that they “entangle and capture” the animalculæ, “and by degrees suck out all that can be digested, leaving only the claws,

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THE TOOTHWORT—continued.

hairs, and other hard parts.” Such entangling threads are unlike anything on record in the Vegetable Kingdom ; but there is nothing inherently improbable in the glands exuding an acid secretion which might digest proteid matter, while other glands might well absorb the liquid products either of such digestion or of the decay of animal bodies and of the vegetable humus in which the plant grows. In this case, whether carnivorous or not, it would be saprophytic as well as parasitic.

The flowering branch rises from the ground much bent over to one side, bearing bracts, much like the scales of the rhizome but more loosely arranged, with a sub-sessile drooping flower in the axil of each. The whole forms a second two-rowed raceme some four to six inches long, recalling the arrangement of the flowers of the Henbane, and straightening itself as the flowers open. The calyx is white, hairy at the base, campanulate, and divided into four lobes of which the two posterior ones are the larger. The tube of the corolla is also white, but the limb divides into two pale purplish lips, the upper one arched and either entire or bifid and the lower smaller and divided into three. Abundance of honey is secreted by a nectary below the lower (anterior) surface of the ovary, and the stigma, which has two unequal lobes, matures before the anthers and projects at first beyond the hood of the corolla. The pollination is mainly effected by humble-bees, the mechanism being a form of the loose pollen type. The dry pollen falls from the connivent anthers, but is held by the thick brush of hairs upon them : the anthers are pressed apart by the bee’s proboscis and the pollen then falls upon the head of the insect.

“ In the meantime,” says Lord Avebury, “ the corolla-tube lengthens and eventually covers the stigma. The stamens also elongate, and project at last beyond the tube ; the dry pollen is carried away by the wind, and as the plants generally grow in patches, some must occasionally reach the stigmas of younger flowers.”

The one-chambered, ovoid ovary contains many ovules on its two lateral placentas. When half-ripe, the capsule is so like a human tooth in form and colour that it has been suggested that it is to this character and not to its leaf-scales that the plant owes—or should owe—its name. The ripe capsule has a thin wall which bursts elastically, so that the many seeds may have some better chance of finding a suitable place for their germination.

Altogether, though not beautiful, this is certainly a most highly specialised plant. It has, however, a congener, *L. clandestina* Linné, sometimes made the type of a separate genus *Clandestina*, which combines these many points of structural and physiological interest with considerable beauty. It grows on the roots of Willows, and, though having no claim to rank as a British plant, sometimes occurs as an escape from botanical gardens. Its flowers, which in form recall those of the Dwarf Red Rattle, are of a fine deep violet-blue, like those of the Wild Hyacinth.

Linné’s generic name *Lathræa* for these plants is from *λαθραῖος*, *lathraios*, hidden, and refers to the shady spots in which they grow.

CCLXIII.—THE COMMON BUTTERWORT.

Pinguicula vulgaris Linné.

ONE of the most interesting results of the study of systematic botany is the realisation that physiological adaptations of an extremely complex character have frequently been reached by several entirely distinct lines of descent. That a green-leaved Flowering Plant growing in poor or acid marshy ground should exude an acid secretion accompanied by enzymes, by means of which it is able to digest complex organic compounds, whether carbo-hydrates or nitrogenous proteids, and should then absorb the products of such digestion, would seem so complex an adaptation that we might well expect that plants exhibiting it would prove to be nearly related to one another. Whilst, however, we have a Family of plants, the *Droseraceæ*, all of which exhibit this physiological adaptation, we have more than one other such group, only remotely related to them, as all Dicotyledons are related, in which we find the same complex method of abnormal nutrition. Such a Family is the *Lentibulariaceæ*, the Butterwort and Bladderwort Family. Butterwort and Sundew, in other words, may grow side by side, practically under the same conditions ; and each has a small root-system and a rosette of radical leaves with a viscid secretion which becomes acid and has the power of digesting the small insects captured by its stickiness. When, however, we compare the floral structure—the main criterion of affinity among Spermatophytes—we find that, whilst Sundew has a small polypetalous polysymmetric flower with strong suggestions of affinity with the Saxifrages, Butterwort has a gamopetalous monosymmetric one suggesting rather the *Scrophulariaceæ*.

The *Lentibulariaceæ* are not a large Family : they include only five genera with some two hundred and fifty species between them, our two British genera, *Pinguicula* and *Utricularia*, having, in all, thirty and two hundred respectively, though only four of the former and five of the latter occur in our islands. All the Family are aquatic or marsh plants with insectivorous functions. Their leaves are exstipulate, and their pentamerous, perfect flowers are in one-flowered, racemose, or spicate scapes. The calyx is inferior, persistent, and gamosepalous, and is generally distinctly two-lipped, the upper and lower lip being sometimes three- and two-cleft respectively. The corolla is gamopetalous, hypogynous, two-lipped, spurred, and deciduous, with a short tube and a convex palate. Only the anterior pair of stamens are developed, a contrast to *Veronica*, in which it is the posterior pair that is so : they are epipetalous and included, and bear one-chambered anthers, which dehisce transversely. There are two united superior carpels, forming a one-chambered ovary, with numerous ovules on a free-central placenta, which becomes a two-valved capsule and suggests an affinity with the *Primulaceæ*. The stigma is, however, divided into two unequal lobes and the seeds are exalbuminous.



THE COMMON BUTTERWORT—continued.

Commenting on Robert Brown's separation of this group from the *Primulaceæ*, Sir J. E. Smith says :—

“Although the difference between a regular and an irregular flower is by no means sufficient, in general, to constitute a separate Natural Order ; yet in the present case that difference is confirmed by so many additional circumstances, that few Orders can be better defined, or more obvious.”

The Butterworts—the name being applicable to all the genus *Pinguicula*—are small plants with small roots ; rosettes of undivided, entire, viscid, radical leaves, the edges of which become inrolled ; and solitary flowers bearing a superficial resemblance to Violets. *P. vulgaris* Linné is, in fact, sometimes known as *Bog*, or *Marsh, Violet*. The genus belongs mainly to the extra-tropical regions of the Northern Hemisphere, including Arctic and alpine situations ; but it extends along the Andes to Fuegia.

The name *Pinguicula*, from the Latin *pinguis*, fat, was given by Gesner, probably from the viscid or greasy surface of the leaf, though it may have referred to the use to which the leaves are put in northern lands.

“Butterwort,” says Lindley, “has the property of giving consistence to milk and of preventing it separating into either whey or cream. Linneus says that the solid milk of the Laplanders is prepared by pouring it, warm from the cow, over a strainer on which fresh leaves of *Pinguicula* have been laid. The milk, after passing among them, is left for a day or two to stand, until it begins to turn sour ; it throws up no cream, but becomes compact and tenacious, and most delicious in taste. It is not necessary that fresh leaves should be used after the milk has once turned ; on the contrary, a small portion of this solid milk will act upon that which is fresh, in the manner of yeast.”

This rennet-like property of the secretion of its leaves has given the plant the names of *Thickening-grass* in Ayrshire, *Earning-grass* in Lanark, and *Steep-grass* near Belfast, *earning* and *steep* being local names for rennet. It is, of course, the property by which the plant, in a wild state, utilises captured organic matter, including pollen, seeds, or leaves of other plants, as well as insects. The following notes are from Darwin's summary of his experiments :—

“The margins of the leaves are incurved. Their upper surfaces are thickly covered with two sets of glandular hairs, differing in the size of the glands and in the length of their pedicels. . . . All the glands secrete a colourless fluid, which is so viscid that I have seen a fine thread drawn out to a length of 18 inches. . . . The edge of the leaf is translucent and does not bear any glands ; and here the spiral vessels, proceeding from the midrib, terminate in cells marked by a spiral line, somewhat like those within the glands of *Drosera*.

“ . . . dead insects and other nitrogenous bodies excite the glands to increased secretion ; . . . the secretion then becomes acid and has the power of digesting animal substances, such as albumen, fibrin, &c. Moreover, the dissolved nitrogenous matter is absorbed by the glands, as shown by their limpid contents being aggregated into slowly moving granular masses of protoplasm. The same results follow when insects are naturally captured, and as the plant lives in poor soil and has small roots, there can be no doubt that it profits by its power of digesting and absorbing matter from the prey which it habitually captures in such large numbers.”

CCLXIV.—THE COMMON BLADDERWORT.

Utricularia vulgaris Linné.

THE *Lentibulariaceæ* exhibit so much specialisation in the physiology of their nutrition and in their floral structure that we have not space here to do justice to them in all their aspects. Before passing on to the Bladderworts, however, we should like to call attention to the fact that, besides the fairly general *Pinguicula vulgaris* Linné, with violet flowers two-thirds of an inch long, we have, in the north of Scotland, *P. alpina* Linné, with white flowers, half an inch long, with a very short conical spur ; in the south-west of England, Ireland, and the west of Scotland, *P. lusitanica* Linné, with pale lilac flowers of the same size and a short incurved spur, a species confined to westernmost Europe ; and in the west of Ireland, the much larger *P. grandiflora* Lamarck ; and that in the Dingle promontory, *P. vulgaris* and *P. grandiflora*, occasionally produce natural hybrids.

The Bladderworts (*Utricularia*) are in their vegetative structures singularly unlike the Butterworts. The two hundred species of the genus include many Tropical forms, some of which have very large and beautiful blossoms, often blue. Some of these Tropical species are terrestrial, developing runners : others are epiphytes, with tubers in which water is stored. The species of Temperate regions, however, are all aquatic, though, as Lord Avebury points out, their flowers, produced above water, and with pollen and other structural characters adapted to insect-pollination, point conclusively to their original terrestrial ancestry. They are absolutely rootless even in the embryo, and their stems perennate by means of hybernacula formed of a compact terminal bud, the rest dying away. The leaves are divided up into slender filamentous pointed segments and float just below the surface of stagnant and often foul waters. This foliage and the personate flower were the origin of Lobel's name for the plant, *Millefolium palustre galericulatum*, translated as *Hooded Water Milfoil*.

In all our five British species the utricles or bladder-like traps, from which the genus derives its name of *Utricularia* or *Bladderwort*, from the Latin *utriculus*, a little bladder, are on these submerged leaves ; and apparently in all the species of the genus the bladders, though sometimes seeming to be on other parts, represent modified leaf-segments. The bladders are generally borne near the base of the leaf-segment on a short footstalk, and vary in length in the different species from a twelfth to a quarter of an inch. They are translucent and pale green, and have walls two cells thick. Their lower surface—that nearest to the leaf—is flatter, the upper rounded and terminating in what Darwin termed the *antennæ*, two branched multicellular bristles as long as the bladder itself, several unbranched bristles, and the trap-door. This is a semicircular valve or swing-door opening inwards only and shutting against a jamb, collar, or *peristome* formed by a thickening of the margin of the lower surface. The valve is colourless, transparent, flexible,



THE COMMON BLADDERWORT—continued.

and elastic ; and it bears two pairs of bristles as long as itself near its free edge and a number of glands. As a whole, the bladder presents a striking likeness to a much magnified entomostracan Crustacean, such as the so-called Water-flea *Daphnia*. Internally the whole surface of the bladder, with the exception of the peristome, is thickly set with papillæ, each bearing two unequal pairs of divergent thin-walled cells. These *quadrifid processes*, as they are termed, are replaced on the peristome by others bearing only two hairs, and hence known as *bifids*.

It was formerly, somewhat naturally, assumed that these bladders were merely floating organs, bringing the plant to the surface to flower. Thus A. P. de Candolle in 1832 circumstantially states :—

“These bladders in the young plant are filled with a mucus heavier than water, and the plant, submerged by this ballast, remains at the bottom. Towards the flowering season the leaves secrete a gas which enters the utricles, raises the operculum, and drives out the mucus, when the plant, now furnished with aerial bladders, rises slowly, and floats on the surface, and there flowers ; this accomplished, the leaves again secrete mucus, which replaces the air in the utricles and the plant re-descends to the bottom, and ripens its seeds in the place where they are to be sown.”

This rising and sinking does take place ; but, as Darwin showed, it does so equally if bladders are absent or removed. The true function of the bladders is solely the capture of minute Crustacea. As a human being wandering over Egyptian deserts or through Burmese jungle is filled with surprise and curiosity at some colossal Memnon or Buddha, so, it seems, the little aquatic crustacean coming to a relatively gigantic representation of itself pushes open the swing-door, and enters, but cannot escape from the utricle. It may swim about for a time, but apparently dies of asphyxia. There does not seem to be any secretion of a digestive fluid. Apparently the dead animalculæ merely decay, and the glands lining the utricle absorb the liquid product of the decay in a saprophytic manner.

The rather large yellow flowers which are borne in a simple and few-flowered bracteate raceme have a mechanism similar to that of *Linaria*. The calyx is deeply bilobed, and the corolla personate with an undivided upper lip, a prominent orange palate, and a honey-containing spur to the lower lip. The two stamens are so bent that their coherent anthers burst downward ; and the stigma consists of two very unequal antero-posterior lobes, the larger of which projects beyond the anthers, so as to be first touched by the flies which pollinate the flowers. It is fringed with hairs which collect the ribbed pollen-grains ; and being sensitive, it rises into a position in which it will not be touched by the insect in leaving and will not, therefore, receive any of the pollen from its own flower.

CCLXV.—BUCK'S-HORN PLANTAIN.

Plantago Coronopus Linné.

ALTHOUGH there is but little disagreement among systematists as to its position, the Order *Plantaginales*, which comprises but one Family, the *Plantaginaceæ*, is certainly a very isolated one. In some species the flowers are visited by insects for the sake of their pollen and give off a perfume ; but in general the Order is anemophilous and is probably a case of degeneration similar to that of the Burnets (*Poterium*) in the mainly entomophilous Family *Rosaceæ*. Adaptation to wind-pollination of plants ancestrally insect-pollinated brings about a floral degeneration comparable to the general degeneracy of aquatic plants, but affecting the flower only ; and the general opinion is that the *Plantaginales* represent such a case of degeneracy from the *Tubifloræ*, or perhaps we may speak more specifically and say from the *Scrophulariaceæ*. The plants are herbaceous, and have scattered exstipulate leaves, and individually inconspicuous, tetramerous, and polysymmetric flowers. The calyx is inferior and gamosepalous, consisting of four sepals placed diagonally : the corolla consists usually of four united membranous petals ; and the four stamens have very long filaments and exserted versatile anthers, generally maturing after the stigma and containing much dry powdery pollen. There are two united superior carpels with a feathery stigma and central placentation : the fruit is dry, capsular, and generally transversely dehiscent ; and the seeds are albuminous.

The Family, which is now represented in most Temperate regions, comprises only three genera, two of which are British. The Shoreweeds (*Littorella*) are amphibious plants with semi-cylindric radical leaves and monœcious flowers in groups of three, the ovary being one-chambered, indehiscent, and one-seeded. There are only two known species—the European *L. lacustris* Linné and another in South America.

The Plantains (*Plantago*), on the other hand, comprise some two hundred species, about a quarter of which number are European, whilst five are British. They are land plants, with their leaves usually all radical and furnished with prominent parallel veins, and their small flowers in terminal spikes and generally perfect and protogynous. The ovary is two- to four-chambered with central placentation, and the seeds have a mucilaginous testa which has probably played an important part in securing for some of the species a very wide geographical distribution.

Several of the species are only too well known as troublesome weeds in our lawns and their relationship to one another has long been recognised. The significance of Pliny's name *Plantago* is unknown ; but, from the sixteenth century, names derived, like our English *Plantain*, from it have been the most general appellations for the whole group. The Greek ἀρνόγλωσσος, *arnoglossos*, lamb's-tongue, from ἀρνός, *arnos*, of a lamb, γλῶσσα, *glossa*, a tongue, is represented in some of the mediæval vocabularies by such forms as *Arnoglosa*, *Arnaglosse*, and *Arniglosa*, and is still used in its English form *Lambstongue*, chiefly for *P. media* Linné, a broad-leaved downy



BUCK'S-HORN PLANTAIN—continued.

plant most frequent on calcareous soil with spikes of fragrant flowers with lilac bracts and cream-coloured anthers.

Another well-known species, *P. lanceolata* Linné, with erect leaves, generally strongly five-ribbed and a short spike at the end of a long peduncle, with black bracts and white anthers, was known in mediæval times as *Ribbe*, *Quinquenervia*, *Lanceolata*, and sometimes as *Cynoglossa*; but nowadays such children's names as *Blackjacks*, *Knock-heads*, *Cocks and hens*, *Cockfighters*, and *Soldiers*, all derived from the game of knocking off the flower-heads against one another, are, perhaps, more genuinely current than Gerard's *Ribwort*.

The most general mediæval name for Plantains, however, was *Waybread* or *Waybroad*, belonging mainly it would seem to the broad-leaved and long-spiked *P. major* Linné, now, perhaps, best known from the hawking of its long spikes of fruit, sometimes called *Rat-tails*, as food for cage-birds. Whatever its precise significance, *Waybread* has its German equivalent *Wegetritt*, i.e. Way-tread, and the Swedish *Wagbredblad*, which seemingly means "Wayside broad-leaf." This species has found its way to Australia, New Zealand, and North America, where it early acquired the name of *White man's foot*. There are two allusions in Shakespeare to the use of its gummy leaves for a broken shin; and the seeds of some species, the testa sharing this mucilaginous character, have been used instead of Linseed medicinally, and also to stiffen muslin and silk.

A noticeable feature in many species of Plantain is the manner in which they spread out their radical leaves, radiating in many directions, overlapping to the least possible extent so as to receive the maximum of light, and pressed close to the ground so as to intercept all radiated heat and incidentally to kill any growth below them. This is well exemplified in the Buck's-horn Plantain (*P. Coronopus* Linné), the subject of our Plate. Distinctly xerophytic in its characteristics, growing in dry, sandy, and sunny spots, it has economised material in its much-divided leaves: divided though they are, they do not overlap; and their hairiness lessens transpiration. While it shares with several other plants with divided leaves Dioscorides's name *Κορωνόπους*, *Koronopous*, crow's-foot, from *κορώνη*, *korone*, a crow, and *ποῦς*, *pous*, a foot; and also, according to Turner, the name *Herbe Iwe*, supposed to be Pliny's *abiga*, the name *Buck's-horn Plantain* is Lyte's rendering of Lobel's *Cornu cervinum*, and Ray records as in use in Suffolk the pretty and appropriate name *Star of the Earth*. It is either annual or biennial and varies much in size and succulence. Its peduncle is round: its bracts are longer than the sepals: the two lateral sepals have a winged membranous ciliate keel: the stamens are a pale yellow; and the ovary has three or four chambers, each containing a single seed.

Turner, writing of it under the name *Coronopus* in 1548, says:—

"It myghte wel be named crowfote weybreaðe, it groweth much aboute Shene aboute London, it leueth wel to growe by the sea bankes also."

CCLXVI.—THE FIELD MADDER.

Sherardia arvensis Linné.

THE intercalary growth which brings about the so-called adhesion between the perianth and the ovary, making the latter inferior, is always looked upon as an indication of a higher and more specialised condition than the absence of such adhesion. Thus, while other considerations compelled us to leave the epigynous Whortleberries in close association with the hypogynous Heaths, the three remaining Orders of the *Sympetaleæ*, named by Engler *Rubiales*, *Aggregateæ*, and *Campanulateæ*, are by common consent placed in close juxtaposition, and according to modern views constitute the summit of the Vegetable Kingdom. United mainly by this character, they formed in Bentham and Hooker's system the Series *Inferæ* of the *Gamopetaleæ*. Being almost always adapted to economical pollination by insects, they have only a single whorl of stamens, though sometimes there is a further reduction, so that there may be fewer stamens than there are petals. Throughout all three Orders, moreover, we may trace a tendency towards the multiplication of small flowers becoming conspicuous by being massed together, and requiring, on account of their number, to form one or at most a few seeds to each flower.

The *Rubiales* have the parts of the flower in fives or fours, though often with only two carpels, forming a two-chambered ovary, which may have one or more anatropous ovules in each chamber. The Order comprises two Families of very unequal size, the *Rubiaceæ* and the *Caprifoliaceæ*.

The Family *Rubiaceæ* is one of the largest in the Vegetable Kingdom, having some 4,500 species in 350 genera. Most of them are Tropical, and the Family includes many trees and shrubs. They have opposite, decussate, stipulate leaves; cymose inflorescences; polysymmetric, perfect flowers, secreting honey by epigynous disks; epipetalous stamens alternating with the petals; and generally two carpels. Many of the Tropical species, such as the Bouvardias and Gardenias, are remarkably fragrant; and many have very long corolla-tubes adapted for pollination by long-tongued Lepidoptera. Several are of great economic importance, such as the species of the Andean genus *Cinchona*, which yield Peruvian, or Jesuits', Bark, the source of quinine; the African genus *Coffea*, the horny endosperm in the seeds or "beans" of which is roasted and ground as coffee; and the Brazilian *Uragoga Ipecacuanha* Baillon, the annular roots of which are a most valuable drug. The Family is divided into twenty-one Tribes which fall into two Sub-Families, the *Cinchonoideæ*, with numerous ovules in each chamber of the ovary; and the *Coffeoideæ*, with only one.

Seven out of the eight European genera in the Family belong to the Tribe *Galieæ*, which includes some three hundred species, all herbaceous and natives of Temperate or Arctic regions. They have four-angled stems, sometimes woody at the base, and leafy interpetiolar stipules often as large as the leaves. They thus seem to have whorled leaves and have been known accordingly as *Stellateæ*. It is



THE FIELD MADDER—continued.

only by noting the buds in the axils of the leaves that they can be readily distinguished from the stipules. The number of foliar organs in each whorl varies from four to ten. The simplest case is a whorl of six, viz. two leaves, each with two separate stipules. Union of the stipules in pairs produces a whorl of four; a division of each stipule into two, a whorl of ten; and a union of two pairs of these half-stipules, a whorl of eight. They have small flowers in which the honey is but slightly concealed, so that pollination is chiefly effected by flies. The corolla is valvate in the bud: there are two styles: the ovules are ascending, so that the micropyle faces downwards; and the fruit divides into two indehiscent mericarps.

There are four British genera—*Sherardia*, *Asperula*, *Galium*, and *Rubia*, the Field Madder, the Woodruff and Squinancy-wort, the Bedstraws, and Madder. The first named of these is represented by a single species, a striking little annual, fairly common in fallow fields or other sunny places on light soil. It has a prostrate habit and the whole plant is bristly. This and the apparent whorls of six leaves have served from early times to indicate its affinity with the Bedstraws, Madders, and Woodruffs; but we have been unable to trace the name *Spurwort*, quoted by Dr. Prior as from the Italian *speronella*, the rowel of a spur, and referring to the whorl of stiff leaves.

Turner, in 1548, writes of it:—

“Alyscon Plinii is a rare herbe whiche I coulde neuer see but once in Englande and that was a litle from Syon. It had leaues lyke madder and purple floures, it maye be named in Englishe purple goosgrase.”

Later on he explains that “it helpeth the biting of a wod [mad] dogge,” Alyscon being from the Greek *ἀλ*, *a*, not, and *λύσσα*, *lussa*, madness.

The Bauhins called it *Rubeola*, and Parkinson, *Rubia minor pratensis cærulea*. Linnæus finally adopted the name given by Dillenius in 1719, in honour of Dr. William Sherard (1659-1728), Consul at Smyrna, pupil of Tournefort, friend of Ray, Vaillant, and Boerhaave, and founder of the Sherardian professorship at Oxford.

The flowers are collected in terminal sessile, umbellate heads surrounded by an involucre of seven or eight leaves. The calyx is divided into four teeth, two of which are bifid, so that it persists as six teeth on the fruit. The corolla is funnel-shaped, with a short tube and four lobes, and varies in colour from pale violet to pink, yellow, or white. Some of the flowers are exclusively carpellate; but in those that are perfect there is but little difference in the date of maturity of anthers and stigmas, and the latter are perfectly fertile if pollinated by pollen from the same flower. Cross-pollination may, however, be effected by flies which are the chief insects to visit the flowers for the honey. The fruit is bristly, which probably assists in the dissemination of the plant, which has spread over most of Europe, western Asia, and North Africa.

CCLXVII.—CROSSWORT AND LADY'S BEDSTRAW.

Galium Cruciata Scopoli and *G. verum* Linné.

OF the four British genera of *Rubiaceæ* only two are here represented. Those not represented are *Rubia*, the Madders, which give the name to the Family and Order, and *Asperula*. *Rubia* (named from the Latin *ruber*, red, from the red dye alizarin obtainable from the roots of several species, such as *R. tinctorum* Linné and *R. cordifolia* Linné, the Manjit of India) has no distinct limb to the calyx, a five-lobed corolla, four stamens, and a succulent fruit. It is represented by one British species, the long, straggling, bristly evergreen *R. peregrina* Linné of our southern coasts. The large genus *Asperula*, which contains some eighty species, half of which are European, has only two species in Britain, the favourite Woodruff (*A. odorata* Linné), with fragrant white blossoms and foliage yet more fragrant when pressed from the coumarin which it contains, and the Squinancy-wort (*A. cynanchica* Linné), growing on dry, sunny chalk-banks, with narrow linear leaves in whorls of four, and white or pink flowers.

Galium is by far the largest genus in the Tribe, containing some 200 species, half of which are European, while of these thirteen are British. Some are annual, others perennial: the flowers are in cymose clusters and are individually minute, with exposed honey: the calyx has no teeth: the corolla is rotate, almost always four-lobed, and either yellow or white; and the fruit is dry. Most species are protandrous, but anthers and stigmas are so near together that self-pollination will, no doubt, often take place.

The best-known British species is, perhaps, *G. Aparine* Linné, variously known to country-folk as *Cleavers*, *Clivers*, *Goose-grass*, *Harif*, *Tongue-bleeder*, or many another similar name, since the minute hooks with which the whole of the bright green hedgerow weed is covered make it a favourite amusement for children to stick it on one another's backs, or to persuade some unsuspecting person to put a leaf on their tongue. Even ancient Greek names, such as *φιλόανθρωπος*, *philanthropos*, lover of man, and *ἀπαρίνη*, *aparine*, may have the same significance, though the latter may either be from *ἀπαίρω*, *apairo*, I take hold of, or from *ῥίνη*, *rhine*, a file. *Harif* is the Old English *hegerife*, hedge-robber; and *Goose-grass* refers to the use of the plant, when chopped up, as food for goslings.

Other familiar species are the tall Hedge Bedstraw (*G. Mollugo* Linné) that waves its large clusters of tiny white flowers on a stout but smooth stem, with broad leaves in whorls of eight, above our hedgerows; and the little prostrate Heath Bedstraw (*G. saxatile* Linné), also white-flowered. Most of the species are scentless; but this is not the case with the Crosswort (*G. Cruciata* Scopoli) which appears on the left of our Plate.

This species is perennial, having a slender creeping rhizome, its aerial stems, branching slightly at the base, growing a foot or eighteen inches in length, and either



CROSSWORT AND LADY'S BEDSTRAW—continued.

lying prostrate or supporting itself among bushes. The soft leaves are apparently four in a whorl, from which character the plant derived its old generic name *Cruciata*, which—retained by Linné and by Scopoli as a specific name, and, therefore, written with an initial capital—has the appearance of a false concord when we see its seeming feminine termination placed in agreement with the neuter *Galium*. The leaves are elliptical, with three prominent longitudinal veins, and both they and the stems are covered with long white spreading hairs. The small bright yellow flowers are in small corymbose axillary cymes of about eight flowers each, with two minute ovate bracts to each cyme. The clusters are andromonœcious, the lower and outer flowers being generally exclusively staminate, while the terminal ones are perfect. Rich in honey and deliciously fragrant, these flowers gained for the plant the old name of *Golden Muguet*, from the Old French *musquet*, the Latin *moschatus*, musk-scented; and Miss Plues in 1863 dubbed it *Honeywort*. The stalks of the perfect flowers bend downwards after pollination, so that the smooth globular fruits ripen beneath the leaves. The plant is not uncommon on dry banks and flowers in May.

In perennial growth, the yellow colour of its flowers, and the smoothness of its fruits, the Yellow Bedstraw (*G. verum* Linné), the plant represented on the right of our Plate, agrees with the Crosswort; but its leaves, which are in whorls of eight or twelve, are very narrow and have only one vein, and its more golden blossoms are in more extensive densely-crowded terminal as well as axillary clusters. Its tawny rhizome sends out suckers, and is stated to yield a better red dye than the Madder. The numerous erect or ascending stems, from one to three feet in height, are four-angled and somewhat woody at their base, and may be pubescent; while the revolute margins, downy under surfaces, and deflexed position of the narrow-pointed leaves indicate xerophytic adaptation. The flowers are perfect and protandrous, and have the same honey-like perfume as those of the Crosswort, especially in the evening, or before rain. After discharging their pollen, the anthers turn brown and the whole plant turns black in drying. The small round fruits become black and are not concealed as they ripen. A hybrid with *G. Mollugo* Linné, known as var. *ochroleucum* Syme, occasionally occurs. It has straw-coloured flowers and is green when dry.

The perfume of *G. verum* Linné gained it the French name of *Petit Muguet*, while for the number of its flowerets it is known in Scotland as *A hundred fald*. Names with a longer history are derived from the use of the blossoms as rennet to curdle milk in the making of cheese. This is the origin of the *Γάλιον*, *Galion*, of Dioscorides, from *γάλα*, *gala*, milk; the specific name *verum*, true, indicating that this was the species employed, as it was both in Tuscany and in Cheshire, in the sixteenth century; and in some places the plant is still known as *Cheese-rennet*. More familiar now, however, is the name of *Lady's Bedstraw*, the *Sanctæ Mariæ stramen* of the Latin, or *Unser lieben Frauen Bettstro* of the Germans; and Nicholas Poussin has consecrated it in depicting the infant Christ lying upon it in the manger-cradle of Bethlehem.

CCLXVIII.—THE HONEYSUCKLE.

Lonicera Periclymenum Linné.

FEW Families are so heterogeneous as the *Caprifoliaceæ* or Honeysuckle Family. They were separated from the *Rubiaceæ* by Jussieu and De Candolle at a time when many of the Tropical sections of that Family were unknown, and one by one all the various distinctions between the two groups seem to have broken down. Difference of habit, absence of stipules, imbricate æstivation, a succulent fruit, none of these proves distinctive ; with the result that Fritsch, Höck, and Schumann propose to separate the Elders (*Sambucus*), which have stipules, placing them either in *Valerianaceæ* or in a Family by themselves, and the Moschatel (*Adoxa moschatellina* Linné) into another ; and to unite the rest of the *Caprifoliaceæ* with *Rubiaceæ*.

If we do not take exactly this course, we have to group the twelve or fourteen genera of the *Caprifoliaceæ*, with their 260 species, into five very distinct Tribes, each of which, it happens, is represented by a single British genus, while only two of these five British genera contain two British species. We may then roughly characterise the Family as consisting mostly of perennial woody plants, trees, shrubs, undershrubs, and rarely herbs, belonging to the Temperate regions chiefly of the Northern Hemisphere and the mountains of the Tropics, with opposite and decussate leaves, usually exstipulate ; flowers in cymes, usually pentamerous, with the odd sepal posterior, perfect, and either polysymmetric or monosymmetric ; corolla imbricate ; stamens epipetalous and usually five, but varying from four to ten, in number ; carpels from two to six in number, united into a many-chambered, inferior ovary, with one or more ovules in each chamber ; a usually succulent fruit, *i.e.* a true berry ; and small albuminous seeds. The Tribes, under this tentative grouping, will be :—(1) the *Lonicereæ*, with simple exstipulate leaves, flowers generally monosymmetric, and numerous ovules in each loculus of the ovary, a Tribe including the Honeysuckles (*Lonicera*), and the Diervillas or Weigelas of our gardens ; (2) the *Linneææ*, with simple exstipulate leaves, polysymmetric flowers, and only two of the loculi with many ovules, including *Linnea* and *Symphoricarpos*, the Snowberry-tree ; (3) the *Viburneæ*, with simple leaves, sometimes lobed, a rotate corolla, introrse anthers, and one ovule in each loculus, including the Guelder-roses ; (4) the *Sambuceæ*, with pinnate stipulate leaves, rotate corolla, extrorse anthers, and one ovule in each loculus, containing only the genus *Sambucus*, the Elders ; and (5) the *Adoxeæ*, including only the one species, a herbaceous plant with trternately compound leaves, rotate corolla, bifurcate stamens, and one ovule in each loculus of its ovary.

In number of species the two genera which take the lead in the Family, *Lonicera* and *Viburnum*, are apparently about equal, with over a hundred species each. The headquarters of both genera would appear to be in western China. In the Cool-temperate Zone of that region, at an altitude, that is, of between 5,000 and 10,000 feet, Mr. E. H. Wilson reckons sixty species of the former genus and seventy of



THE HONEYSUCKLE—continued.

the latter, whilst *Lonicera* extends upwards into the Zone above, the Sub-alpine, between 10,000 and 11,500 feet up. Mr. Wilson points out that many species hitherto considered Japanese, because brought from Japanese gardens, are truly natives of western China. It is, however, certain that there are many species of *Lonicera* peculiar to regions to the south, north-east, and west of that visited by him, besides a smaller number in eastern North America.

Most Honeysuckles are erect shrubs, only a few twining as our British species does. The opposite entire leaves are often connate and are stated to form in that case an effective barrier against small creeping insects. The production of several buds in one axil, resulting in a tufted branching, which is not common among plants in general, is frequent in Honeysuckles; and the flowers are often produced in pairs representing a cyme, of which the central flower is suppressed. There is often also a fusion between the ovaries of two flowers. The calyx has generally five small teeth and the corolla is monosymmetric with a bilabiate limb, four petals uniting in the posterior lobe and both it and the one anterior one being reflexed. Flies visit the flowers for pollen; and, as the long tube is sometimes half full of honey, the larger humble-bees also visit them; but pollination, in our species, is mainly effected by hawk-moths, especially the Privet and Convolvulus hawk-moths, during the night. The flower-buds are nearly vertical and the anthers burst just before the flower opens.

"The first flowers expand, and become strongly scented," writes Lord Avebury, "about seven o'clock in the evening, and by eight most of them are open. . . . Soon after opening the flowers turn downwards and become horizontal. The flowers are homogamous, but in the first state of the flower, while the stamens project straight in front, the pistil is turned somewhat downwards; moreover it projects beyond the anthers, so that self-fertilisation is doubly precluded. . . . The stamens gradually turn downwards, while the pistil rises and takes their place. . . . During the first night, therefore, an insect-visitor would rub its breast against the anthers, during the second against the stigma."

Lord Avebury then points out that meanwhile the two corolla-lips roll up and the colour changes from red externally and white within to a uniform yellow and finally to a dirty orange, by which stage the perfume has ceased, so that the flowers have ceased to attract.

The generic name *Lonicera* was given by Linnæus in honour of Adam Lonicer of Frankfort (1528-86); whilst the specific name of our British species *Periclymenum*, Dioscorides's *Περικλύμενον*, *Periklumenon*, is from *περικλείω*, *perikleio*, I entwine.

CCLXIX.—LINNÆA.

Linnæa borealis Linné.

IT would have been strange if so generally distributed and so beautiful a plant as the Honeysuckle had not been celebrated by the poets. Under the name of *Woodbine* it has, at least from the fifteenth century, been the type of firm and fast affection, regardless of the physiological fact of its check to the growth of the tree round which it is entwined. The early appearance of its blue-grey leaves trailing along the ground in woodlands has given it in Portugal the pretty name of *Madresylva*, Mother of the Woods ; whilst if its nectar-bearing blossoms share the name of Honeysuckle with Clover and other plants, their beauty identified them among the old herbalists with the *Lily-among-thorns* of the Book of Canticles.

It is naturally otherwise with *Linnæa*. As beautiful in its own way as the Honeysuckle, a plant of northern woodlands, not known in Britain till 1795, it has no English name and no associations save those with the illustrious Swede who chose it to bear his name.

It is the only known species of its genus, which is a very isolated one, and has an interesting and distinctively northern type of distribution, occurring in all three of the circumpolar continents and extending in Europe from Lapland to Piedmont and Lombardy. Though perennial and wiry, it is very slender and trails along the ground, its stems, which are sometimes a foot or more in length, sending up ascending branches which end in a slender, erect, two-flowered peduncle two to four inches in height. The interlacing stems form broad patches covered by the rounded leathery leaves in the drier upland woods or in shady sub-alpine situations. The leaves are in distant pairs, on petioles about half their own length, and are mostly obtuse, ovate, obovate, or orbicular, about half an inch long, crenate, distinctly veined, and a darker green above than they are beneath. They are evergreen and have no stipules, and both they and the young shoots may be slightly hairy or glabrous. The peduncles bear one or two pairs of leafy bracts and fork into two pedicels, each bearing two pairs of bracteoles and a gracefully drooping bell-like blossom recalling that of the Bog Pimpernel (*Anagallis tenella* Linné). The bracteoles were formerly described by Wahlenberg and Smith as an outer calyx. The inner pair are minute and smooth, but the outer two, decussating with them, are much larger and thicken and enlarge in the fruit stage, becoming covered externally with glandular hairs, and closing over the ovary. The true calyx is superior, campanulate, and deeply divided into five nearly equal lanceolate teeth, which are deciduous in the fruiting stage.

The delicate drooping corolla is funnel-shaped rather than bell-shaped, being very narrow at its base but spreading as it divides into its five nearly equal lobes. Pink externally with a hue between that of a maiden's blush and that of the flesh of a salmon, it is variegated internally with rose-colour and yellow, and lined with



hairs that serve to exclude small creeping insects and to hold the honey which is secreted between the bases of the two shorter stamens. At night the flowers emit so powerful a perfume, like that of Meadowsweet, *i.e.* coumarin, that it is noticeable at a considerable distance. This fact, coupled with their pale colour, suggests that it is pollinated by crepuscular moths. The pendulous position of the flower will, of course, protect the honey from rain.

There are four stamens inserted near the base of the corolla-tube in two pairs, the upper pair the shorter, but all four included within the corolla. The versatile anthers mature at the same time as does the stigma; but, as the latter projects considerably beyond the anthers, it will probably be first touched by the head of any visiting insect. The ovary is three-chambered; but two chambers and the ovules they contain become aborted, only one pendulous seed remaining in the one chamber of the dry fruit. This is apparently rarely formed in Britain.

The plant, though plentiful enough in Scandinavia and northern Russia, is found at very few localities in England and not at many in Scotland. It occurs here in dry, stony fir woods from Yorkshire northwards along the east side of the island, extending in some localities to an altitude of 2,400 feet. With us it is apparently seldom in flower until July; but in the rapidly developing spring of Lapland it comes out as early as May.

It is somewhat unfortunate that, according to our modern rule of not citing pre-Linnæan names, it looks as if this plant was actually named by Linné in his own honour—a practice which has never been usual among botanists. It was, however, merely indicated by him to his friend Dr. Johann Friedrich Gronovius (1690-1762) as “a little northern plant, long overlooked, depressed, abject, flowering early,” and thus fitted to typify himself. Bauhin had called the plant *Campanula serpyllifolia* and Petiver described it as *Nummularia Norwegica*, so that it required a new generic name; whilst no specific name could better express its distribution than *borealis*.

Carl Linnæus, the great naturalist, whose name this plant bears, was born at Råshult in Sweden, on May 23rd, 1707, the son of a poor pastor. Beginning the study of plants when four years old, he narrowly escaped apprenticeship to a tailor or shoemaker, but struggled in much poverty through the universities of Lund and Upsala, becoming a deputy professor at the latter in 1730. Gronovius in 1735 bore the expense of the first edition of the “*Systema Naturæ*,” in eight folio sheets, the foundation of Linnæus’s fame as a naturalist. Then, under the patronage of the rich banker Clifford of Hartecamp, Linnæus visited England in 1736, and, in 1737, published his “*Genera Plantarum*.” In 1740 he became professor in the university of Upsala, which rejoiced in the lustre of his successive works during the remaining thirty-eight years of his life. When, in 1761, he was granted a patent of nobility, his crest was a sprig of *Linnaea* illumined by the rising sun. The crest and arms are now borne by the Linnean Society of London.

CCLXX.—THE GUELDER-ROSE.

Viburnum Opulus Linné.

THE genus *Viburnum* probably comprises more than a hundred species. Few of them can be dignified with the name of tree, though all are woody. The leaves are stalked and simple; their flowers polysymmetric and generally grouped in corymbose clusters; the corolla rotate and white, or tinged with pink; the stamens five, with introrse anthers; and the ovary surmounted by three stigmas, though of its three chambers only one develops a seed.

The origin of the name is obscure. When, in his first Eclogue, Virgil writes—

“Quantum lenta solent inter viburna cupressi”

—Messrs. Lonsdale and Lee, ingeniously but without much authority, translate “as cypresses are wont to tower among the bending osiers,” the sense evidently requires some flexible wood, and *Viburnum* has been connected with the verb *vieo*, I bend; while the long flexible shoots of the Guelder-rose (*V. Opulus* Linné) have been used as whip-switches.

In our gardens, besides the neuter variety of this species, commonly known as the *Snowball-tree*, and the old favourite evergreen Laurestinus (*V. Tinus* Linné) of southern Europe, we now have many hardy species from western China, which is apparently the headquarters of the genus, the best of which is, perhaps, *V. plicatum*.

Two trees in one genus are in few cases so unlike to the general observer as our two British species, the Guelder-rose (*V. Opulus* Linné) and the Wayfaring-tree (*V. Lantana* Linné). They differ in general habit of growth, in the forms of their leaves, the arrangement of their buds, and the appearance of their flower-clusters. The former is graceful, glabrous, with lobed leaves and an inflorescence noticeable as surrounded by large neuter flowers: the other, rigid, densely pubescent, and with all its flowers alike. The Guelder-rose has leathery bud-scales and stipules: the Wayfaring-tree, naked but densely felted buds. Though some species of the genus extend along the Andes into the Tropics, both our British forms are northern; but the Guelder-rose extends into Scotland and Scandinavia, which the Wayfaring-tree does not.

The Guelder-rose is a straggling shrub or small tree, from six to twelve feet in height, seldom having a single stem of any height. Its long, slender, smooth, green branches are round, or are slightly four-angled towards the apex, and turn to a pale brown. The terminal buds are generally aborted and replaced by a pair of small slightly-stalked, ovate, lateral ones, which are smooth, reddish-brown, and slightly sticky, and are enclosed by two pairs of coherent bud-scales. The young leaves within are palmately three-lobed and have each two or more honey-glands at the top of the short petiole. These glands serve, according to the late Lord Avebury, as an attraction to ants and wasps, which act as a bodyguard to protect the tender young leaves from caterpillars.



THE GUELDER-ROSE—continued.

Towards the end of May or early in June the stronger shoots are terminated with the opening corymbose cymes of blossom. The outer flowers are nearly an inch across, four times the size of the inner ones ; but they are neuter. Having neither stamens nor carpels they are able to throw so much more energy into the production of the large white corolla, which adds to the conspicuousness of the cluster as a whole. "Nature," says Aristotle, "cannot distribute excess simultaneously in many directions"—a truth termed by Geoffroy St. Hilaire and Goethe the law of balancement of growth. "In order to spend on one side," says Goethe, "Nature is forced to economise on the other." Honey and perfume are confined to the perfect flowers in the centre of the cluster ; and accordingly the familiar garden variety, known technically as var. *sterilis*, and popularly as *Snowball-tree*, *Whitsuntide Bosses*, or *Tisty-tosty*, or in French as *Boule de Neige* and *Pelloute de Neige*, and in German as *Schneeballe*, in which all the flowers are neuter and thus form a ball, instead of the normally flat-topped inflorescence, has neither.

By July the leaves have lost the freshness of their green and the blossoms have given place to clusters of loosely-grouped oval berries, then inconspicuous because green, but reddening in August to a pure and limpid crimson, like rubies from the garden of Aladdin. In October the shrub glows with an added charm : a blush of rosy pink suffuses the margins of the leaves, spreads to their centres or from lobe to lobe, deepens to a rich claret colour, and may fade at the edges to a golden yellow.

Rejoicing in moist situations and seen at its best when overhanging a brook, its flexible branches bending under the weight of the ripening fruit, the tree has gained the names of *Water Elder* or *Marsh Elder* and, in German, *Wasserholder*.

We are not surprised that we have seen the beautiful flower-clusters of the wild Guelder-rose hawked in London streets in June, its jewel-like berries offered for sale in September, and its rose-tinted leaves in the same market in October ; but it will be difficult for our hedgerows to sustain for long this triple tax of a huge metropolis with a growing sense of the beautiful. On the other hand, the green shoots and decaying fruit have such an unpleasantly fetid odour that the tree is known in the Isle of Wight as *Stink-tree*. Nevertheless, the juicy, tempting-looking berries are mixed with honey and flour and eaten in Siberia and in Scandinavia, and have also been distilled for spirit. The tough wood of the shoots has been used for shoe-pegs, the stems of tobacco-pipes, and other purposes, and larger stems are imported from the south-east of Europe for walking-sticks and umbrella handles, under the trade names of *Balkun Rose* and *Teazle*.

There are varieties in cultivation with yellow fruit, variegated leaves, or a dwarf habit ; but these, like the barren *Snowball-tree*, can only be reproduced by cuttings or by grafting.

CCLXXI.—THE WAYFARING-TREE.

Viburnum Lantana Linné.

UNDER favourable conditions, in the calcareous loam in which it mostly flourishes, the Wayfaring-tree (*Viburnum Lantana* Linné) may grow eighteen or twenty feet high. Its branches spring from the leaf-axils at angles of about 45° , with fissured grey-brown bark dotted with lenticels and marked with crescentic leaf-scars on their older parts, but slightly angular, a paler yellow-brown, and thickly covered with mealy grey hairs towards their extremities. The long narrow buds soon become naked, two minute bud-scales at their base falling off at an early stage. Each leaf stands erect, folded longitudinally, plaited parallel to the strong secondary veins, with inrolled margins and with the whole outer surface—subsequently to be the under surface—thickly netted with stellate hairs, mostly ten-rayed, when seen under the microscope, and so intercrossed as to form a sort of grey felt.

When in April, or early May, the opposite pairs of ovate leaves unfold, the hairs give the whole bush the appearance of actually revelling in the dust. The leaves may reach a length of three to six inches: they are thick, opaque, and of a dull yellow shade of green, heart-shaped at the base, bluntly pointed at the apex, finely serrate along the margin, ridged on the upper surface along the principal lateral veins, and copiously wrinkled between them. A little later the flat-topped cymes of small white flowers appear at the ends of the rigid branches. The flowers are remarkably articulated at their base to their rigid pedicels, and each consists of five minute sepals, a short, funnel-shaped five-lobed corolla about a quarter of an inch across, five small stamens projecting beyond the corolla, and a short triple style. It is, however, when the leaves turn colour and the insignificant florets have given place to the berries that the Wayfaring-tree most claims our attention. The lustrously polished fruits are about a third of an inch in diameter, and at an early stage are slightly compressed laterally. From a pale green they blush to crimson or the opaque red of coral, mottled, where shaded from the ripening rays of the sun, with a creamy pallor, and finally maturing to a purplish-black, all these tints being often seen in a single cluster. This fruit is thought by some to be not unpleasant to the taste, though slightly astringent, and it is greedily eaten by birds.

As seen in the hedgerow—the yearly victim of the shears or bill-hook—the Wayfaring-tree appears rather rigid than pliant; but when young it grows rapidly, and in coppice woods will produce shoots five or six feet long. These are still used in Germany in basket-making and for tying faggots. Parkinson said of it:—

“The branches hereof are so tough and strong withall, that they serve better for bands to tye bundels or any other thing withall, or to make wreathes to hold together the gates of their fields, then either withy or any other the like.”

He also explains Dodoens's name *Lantana*, the Italian *lentaggine*, “quod lenti sunt rami,” “because the boughs are pliant,” and the French *Hardeau*, from *hard*, “which signifieth a band or rope.”



THE WAYFARING-TREE—continued.

English rustics in the south, using its branches for whips, know the tree as *Lithe-wort*, *Lithy-tree*, *Whip-crop*, and *Twist-wood*; but the thick felt of white hairs has also attracted popular attention. Johnson, in his edition of Gerard, writes :—

“I enquired of a countryman in Essex if he knew any name of this; he answered, it was called the Cotton-tree, by reason of the softnesse of the leaves.”

Whiting, *Whitewood*, *Whitty*, *Whiten-tree*, *Whiten-beam*, and *Mealy-tree* are other southern or midland names.

William Howitt, in his “Book of the Seasons,” thus apostrophises it :—

“Wayfaring-tree! What ancient claim
Hast thou to that right pleasant name?
Was it that some faint pilgrim came
Unhopedly to thee,
In the brown desert’s weary way,
’Mid toil and thirst’s consuming sway,
And there, as ’neath thy shade he lay,
Blest the wayfaring-tree?”

“Or is it that thou lov’st to show
Thy coronets of fragrant snow,
Like life’s spontaneous joys that flow
In paths by thousands beat?
Whate’er it be, I love it well;
A name, methinks, that surely fell
From poet, in some evening dell,
Wandering with fancies sweet.”

It certainly savours somewhat of hyperbole to style the stiff clusters of opaque creamy-white blossoms of this tree “coronets of fragrant snow”; whilst the poet was none other than John Gerard, apothecary and barber-surgeon, so that the “evening dell” may have been in his garden near Fetter Lane, Holborn. Noticing how this roadside bush always looks as if covered with dust, Gerard, in his “Herball” (1597), called it “Wayfaring Man’s Tree,” which, it may be admitted, is, like “Traveller’s Joy” and some of the author’s other coinages, a “right pleasant name,” and bespeaks something of the poet in the mind of the man who made it.

CCLXXII.—THE TUBEROUS MOSCHATEL.

Adoxa Moschatellina Linné.

AMONG the curiosities of Nature are those monotypic genera, admittedly remote from all others, which have been, as it were, left stranded as the current of organic evolution has swept by them. Obviously well adapted to certain surroundings, having a rôle to play in which they can hold their own against any competitors, they have the right to survive, and we can form but a faint notion of the characters of their less well-adapted kinsfolk which have succumbed in the struggle for existence. Such a plant is the Tuberous Moschatel (*Adoxa Moschatellina* Linné). It is apparently the only species in the genus, a form in Kashmir which differs in the number of parts in its floral whorls being considered as merely a variety; and while it has been bandied about, some authors putting it near the Ivies (*Araliaceæ*), others near *Saxifragaceæ*, and many considering it as a Tribe of *Caprifoliaceæ*, Schumann—one of its latest investigators—concludes that “its relationships to any order are not very close,” so that he makes it the type of a Family *Adoxaceæ*, among the *Rubiales*.

Geographically it is a little less boreal than *Linnæa*, belonging to the North Temperate Zone of America, extra-tropical Asia, and Europe, but not extending into Portugal, Turkey, Greece, or the islands of the Mediterranean. This distribution, coupled with its structural isolation, suggests that it may be a type of considerable antiquity among *Sympetaleæ*.

The plant is a perennial, glabrous, and somewhat succulent throughout. It has a white, creeping, monopodial rhizome producing small imbricate tooth-like scale-leaves, with suckers from their axils and long unbranched root-fibres. This terminates in a slender, erect, unbranched, four-angled peduncle, three to eight inches high, and two or three radical leaves. The place and season of its growth and the form of its leaves cause the plant to be sometimes overlooked, it being mistaken by the casual observer for the Wood Anemone (*Anemone nemorosa* Linné), its little head of greenish-yellow flowers being taken for the unripe fruit of the Anemone. The radical leaves are sub-erect, on rather long slender petioles, which are dilated at the base, and are ternately divided into triangular, twice-trilobed leaflets, generally less than an inch in length. On the peduncle is a small pair of opposite cauline leaves or bracts, recalling the three-leaved involucre of the Anemone. They are ternate and have sheathing petioles. The flower-stalk terminates in five flowers in a sessile head, as if on five sides of a cube, constituting, in fact, a much condensed dichasial cyme. All the flowers are polysymmetric and perfect; but the terminal one is usually tetramerous, while the four lateral ones are pentamerous. In the Kashmir variety, alluded to above, the flowers are pentamerous and hexamerous. There is a perianth of two whorls, the outer consisting of two, or more usually three, flat, spreading green segments, which have been described as a bract and two



THE TUBEROUS MOSCHATEL—continued.

bracteoles, but may more probably be a calyx. They are united below, and are adherent half-way up the ovary, much as in Saxifrages, while the teeth persist in the fruit stage. The corolla is rotate, of four segments in the terminal and five in the lateral flowers, spreading, ovate, acute, longer than the sepals, and of a yellowish colour. The stamens alternate with the petals, but are divided almost to their base, thus forming four or five pairs, as the case may be ; and, as is generally the case when stamens branch, the roundish anthers are dimidiate, having, that is, only one chamber on each fork of the filament. The anthers are at first turned outwards but afterwards inwards ; and, as the flowers are stated to be protogynous, this would be a means of favouring cross-pollination by allowing the stigmas to be first insect-pollinated, but, perhaps, permitting self-pollination by the introrse anthers at the later stage. Honey is secreted round the top of the ovary and is freely exposed to the small flies which are the chief insect-visitors. It is when the flowers are thus moist with honey that they emit the musk-like perfume to which the plant owes its name of Moschatel. There are usually four or five carpels ; but more exceptionally three or two, each consisting of a parchment-like chamber containing one pendulous seed and some pulp, with a distinct style above. The baccate fruit becomes succulent, though remaining green and divided internally.

It is not surprising that the earlier botanists were puzzled as to the affinities of this little plant. Pena and Lobel, who were the first to record it in Britain, where they state it to grow in cool shady woods, called it *Minimus Ranunculus Septentrionalium herbido muscoso flore*, “the least Crowfoot of the north with a green musky flower,” and an English translation of this as *Musk Wood-crowfoot* occurs, though it never seems to have been general. Cordus called the plant *Moschatella*, from the Italian diminutive *moscadello*, from *moscado*, musky ; and this would seem to be the origin of our English *Moschatel*. Haller used the form *Moschatellina*, which Linnæus retained as a specific name when he coined the name *Adoxa*, from the Greek *a*, *a-*, without, *δόξα*, *doxa*, glory, in allusion to the very unpretentious appearance of the little plant.

Some little interest attaches to the ecology of this plant. Shallow-rooted and passing through the whole of its life above ground between March and June, and more tolerant of cold than of sun, it occurs as a shade chomophyte in sheltered sub-alpine corries up to altitudes of over 3,000 feet in the Scottish Highlands with *Oxalis*, *Trollius*, and *Mercurialis*. Still more general is its association with the last named, which is thus described by Dr. Moss :—

“At the beginning of April, in the Derbyshire dales, the dog's mercury is about three inches high, its leaves are beginning to unfold, and a few stamens are ripe. At this time of the year, the moschatel is here flowering abundantly, and is almost hidden by the young shoots of the dog's mercury. In the fairly dry portions of the ashwoods of the Peak district, this plant society of dog's mercury and moschatel is a characteristic feature. The society is an excellent example of what Woodhead terms a ‘complementary’ society, as the roots of the dog's mercury reach down to lower layers of soil than the roots of the moschatel, whilst the small and delicate shoots of the *Adoxa* receive their necessary shade from the larger and more vigorous shoots of *Mercurialis*. Before the end of June, *Adoxa* has entered on its long period of dormancy ; and the dull green leaves of the dog's mercury . . . occur in extensive and monotonous stretches.”

CCLXXIII.—ANALYTICAL DRAWINGS OF THE BROOM-RAPE AND BUTTERWORT FAMILIES AND THE PLANTAIN AND MADDER ORDERS.

(*Orobanchaceæ*, *Lentibulariaceæ*, *Plantaginales*, and *Rubiales*.)

THE eleven plants here analysed represent a great variety of structure and function. Parasites, insectivorous plants, those pollinated by wind and those by insects with long or with short tongues, conspicuous and inconspicuous flowers, dry and succulent fruits, representing three Orders and five Families, it is difficult at first sight to recognise the kinship between them.

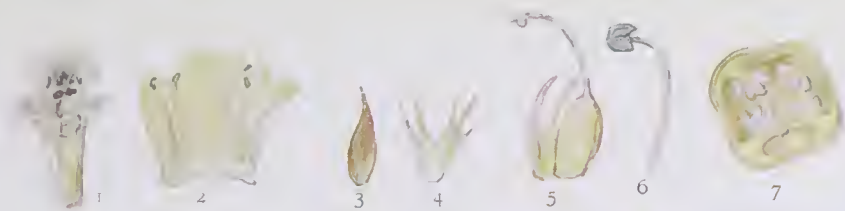
The first line represents the parasitic Lesser Broom-rape (*Orobanche minor* Smith). Fig. 1 is a flower, seen from the front, of natural size ; Fig. 2, the corolla opened so as to show the insertion of the stamens ; Fig. 3, a bracteole ; Fig. 4, the calyx, natural size ; Fig. 5, the gynæceum, with two filaments ; Fig. 6, a stamen ; and Fig. 7, a transverse section of the one-chambered ovary with four placentas.

The second line represents the remarkable Toothwort (*Lathræa Squamaria* Linné), referred to the same Family. Fig. 1 is a flower, seen laterally, of natural size ; Figs. 2 and 3, the two lobes of its corolla with the pairs of stamens ; Fig. 4, the gynæceum, showing the nectariferous scale at the base on its lower side, here represented vertical ; Fig. 5, a cross section of the one-chambered ovary, with two branching placentas ; Fig. 6, a longitudinal section of part of the rhizome and six of the hollow leaf-scales, natural size ; Fig. 7, the base of one of these scales in section and enlarged, so as to show the entrance to the hollow ; and Fig. 8, one of the glands with the filamentous processes, much magnified, these last three figures being after those of Kerner.

The third line represents the Common Butterwort (*Pinguicula vulgaris* Linné), Fig. 1 being a flower seen from above, about natural size ; Fig. 2, the calyx ; Fig. 3, the gynæceum, showing the glandular surface of the ovary and the unequal stigmatic lobes ; Fig. 4, a stamen ; Fig. 5, a longitudinal section of the ovary, showing the free central placentation ; and Fig. 6, the capsule dehiscing.

The fourth line of figures represents the Common Bladderwort (*Utricularia vulgaris* Linné), Fig. 1 being a flower as seen from the front ; and Fig. 2, the same as seen sideways, both slightly enlarged ; Fig. 3, a stamen, enlarged ; Fig. 4, the calyx and young gynæceum ; Fig. 5, the gynæceum, approximately of natural size ; Fig. 6, the same enlarged ; Fig. 7, a longitudinal section of the ovary, enlarged ; and Fig. 8, the ripe capsule dehiscing, also enlarged. The last three figures in this line and in the preceding one are based upon those of Le Maout and Decaisne.

The fifth line represents the Buck's-horn Plantain (*Plantago Coronopus* Linné), Fig. 1 being a flower, of natural size ; Fig. 2, the same enlarged, showing the colourless membranous wings of the sepals ; Fig. 3, the corolla, stamens, and



ANALYTICAL DRAWINGS OF THE BROOM-RAPE AND
BUTTERWORT FAMILIES AND THE PLANTAIN AND MADDER
ORDERS—continued.

feathery stigma ; and Fig. 4, a cross section of the ovary and sepals, showing the branching placentas forming four one-seeded chambers.

In the sixth line the first four figures represent *Galium Cruciata* Scopoli, the Crosswort ; and the other four, *G. verum* Linné. Fig. 1 is a flower of the Crosswort, natural size ; Fig. 2, the same enlarged, showing the stamens alternating with the corolla-lobes and the epigynous disk-lobes in the centre ; Fig. 3 is the smooth gynæceum ; and Fig. 4, a stamen. Fig. 5 represents a flower of *Galium verum* Linné, natural size ; but, as the stamens are shown and they are alternate with the petals, these latter in this figure and in Fig. 6, which represents the same enlarged, should be yellow. Fig. 7 represents a spray of fruits ; and Fig. 8, one gynæceum, enlarged.

The last four lines represent respectively *Linnæa borealis* Linné, the Common Honeysuckle (*Lonicera Periclymenum* Linné), the Guelder-rose (*Viburnum Opulus* Linné), and the Tuberous Moschatel (*Adoxa Moschatellina* Linné). In the seventh line, Fig. 1 is a flower of *Linnæa* as seen from below, *i.e.* in front ; Fig. 2, the corolla opened to show the didynamous stamens ; Fig. 3, the fruit, with involucre and superior calyx, covered with glandular hairs ; and Fig. 4, a cross section of the three-chambered ovary, showing the ovules, of which one only persists as a seed.

In the eighth line, Fig. 1 is a flower of the Honeysuckle, about natural size ; Fig. 2 is the corolla opened to show the insertion of the stamens, one of which has been cut away ; Fig. 3, a reflexed corolla-lobe and a stamen, showing the versatile anther ; Fig. 4, the gynæceum ; Fig. 5, the ovary and superior calyx ; Fig. 6, a cross section of the same in its young state ; Fig. 7, a cluster of the partly confluent fruits ; Fig. 8, a single fruit in longitudinal section ; and Fig. 9, a cross section of a ripe fruit, showing ovules in six rows, two rows in each chamber. With the exception of this last, the figures in this line are of natural size.

The ninth line represents the Wild Guelder-rose (*Viburnum Opulus* Linné), Fig. 1 being one of the outer (neuter) flowers of the cyme, seen from above and of natural size ; Fig. 2, one of the inner (perfect) flowers, natural size, from the same aspect ; and Fig. 3, the same enlarged. Fig. 4 is a stamen, natural size ; Figs. 5, 6, and 7 represent the gynæceum in successive stages ; Fig. 8, the ripe berry ; and Fig. 9, a seed.

The last line of figures represents the Moschatel (*Adoxa Moschatellina* Linné), Fig. 1 being the terminal tetramerous flower as seen from above, slightly enlarged ; Fig. 2, one of the lateral pentamerous ones ; Fig. 3, a petal and part of the staminal ring, representing two bifurcate stamens, enlarged ; Fig. 4, calyx and gynæceum, not much enlarged ; Fig. 5, the same, extensively enlarged ; Fig. 6, the head of five fruits, of which only four are visible, with the persistent calyces ; and Fig. 7, a seed.

CCLXXIV.—CORN-SALAD OR LAMB'S LETTUCE.

Valerianella dentata Pollich.

A good deal of ambiguity unfortunately attaches to the name *Aggregate*, which Engler applies to his eighth Order among *Sympetale*. He uses it to include only the Families *Valerianaceæ* and *Dipsacæ*; whereas Eichler and Warming include the *Compositæ* and the little South American group *Calyceraceæ*, whilst they transfer *Valerianaceæ* to *Rubiales*. The name in either case has reference to that tendency to a reduction in the size of the flower and the fruit, and the crowding or aggregation of many flowers, or one-seeded fruits, together, of which we have already seen indications among *Plantaginales* and *Rubiales*. As limited by Engler, the Order is characterised as consisting of herbaceous plants with opposite exstipulate leaves; crowded cymose inflorescences of small, monosymmetric, or asymmetric flowers; with a pentamerous perianth, but with less than five stamens or carpels, the former epipetalous; and with only one chamber of the inferior ovary containing a pendulous anatropous ovule, though other empty chambers may be present.

It is certainly noteworthy that the tree habit, the attaining, that is, by at least some members of a group, of large dimensions, great individual duration of life, and a woody stem, is far less common among *Sympetale* than among *Archichlamydeæ*; is less common in those higher Orders of the *Sympetale* which have an inferior ovary than in those with a superior one; and is, perhaps, least common in these highest Orders, the *Aggregate* and *Campanulata*. As to the presence of empty chambers in the ovary, the late Lord Avebury, ever prone to look for the explanation of structure in immediate utility to its actual possessor, suggests that it

“perhaps serves a useful purpose by reducing the specific gravity of the fruit and thus enabling it to be more easily carried by wind.”

Considering the variety of seed-dispersal mechanisms displayed by species of the genus *Valerianella*, it may well be that natural selection has taken hold of and intensified this reduction by giving it a secondary utility; but it would seem that in the first case, as in that of so many long-lived and many-fruited trees, such, for instance, as both *Palmaceæ* and *Cupulifereæ*, this reduction in the number of ovules that become seeds, and of carpels that enlarge in the fruit stage, is mainly a case of economy of nutrition.

Engler's Order *Aggregate* contains but two Families, the *Valerianaceæ* and the *Dipsacæ*. The former has generally less than four stamens; three chambers to the ovary, though only one contains an ovule; and an exalbuminous seed; whilst the latter has four stamens, a one-chambered ovary, and an albuminous seed.

The Family *Valerianaceæ* comprises some nine genera, with rather more than two hundred species between them. Chiefly natives of the Temperate regions and mountains of the Northern Hemisphere and of the Old World, especially of Central Europe, the Mediterranean, and Caucasian areas, they are represented in Siberia,



CORN-SALAD OR LAMB'S LETTUCE—continued.

Japan, and Nepaul ; are few in North America ; but are abundant along the Andes, extending into Chile, Fuegia, and the Falkland Islands, and represented by one genus in South Africa. Four genera and some fifty species are European ; whilst in Britain we have three genera and some ten species of common occurrence, although several of these are apparently recent introductions.

Among structural characters hardly mentioned as yet as characteristic of the Family are the calyx, which is but little developed at the time of flowering, but afterwards enlarges into a rim or pappus to the fruit ; the want of symmetry in the corolla, which has usually a nectariferous pouch or spur ; and the introrse anthers.

The rhizomes of the perennial members of the Family generally contain starch, a bitter principle, an acid, and an aromatic volatile oil, so that they have an acrid taste and a penetrating odour. Those of the Great Wild Valerian (*Valeriana officinalis* Linné) are used as a nerve stimulant in cases of hysteria and epilepsy ; and are remarkable for their curiously intoxicating effect upon cats. Those of *V. celtica* Linné and *V. salunca* Allioni, natives of the mountains of Carinthia, Switzerland, and Italy, yield the Celtic Nard, used in Turkey as a perfume ; and *Nardostachys Jatamansi* Royle, a native of Bhotan, is the source of Spikenard.

The genus *Valeriana*, with a nectariferous pouch, three stamens, and a pappus, is familiarly represented in marshy places by *V. dioica* Linné, a stiff, erect plant, with pinnate leaves and pinkish flowers in a crowded terminal corymbose cyme. Far more attractive is the glaucous, entire-leaved Spur-Valerian (*Kentranthus ruber* De Candolle), whose masses of crimson spurred flowers, each with a single stamen, are so familiar on the chalk railway-cuttings of Kent and elsewhere, though it has little claim to be considered a native.

The genus *Valerianella* contains some fifty species of annual plants, remarkable for their repeatedly bifurcating stems and minute polysymmetric flowers, either solitary or in crowded clusters in the forks of their branches. The corolla is funnel-shaped, five-cleft, and without a spur, though containing honey : there are three stamens ; and the calyx-teeth remain on the fruit, though no pappus is formed. They are mostly cornfield weeds in Europe, so that it is not clear how far they can be considered indigenous. Having a cooling mucilaginous juice, one species, at least, *V. olitoria* Pollich, is cultivated as a salad-plant or pot-herb, under the names of *Corn-salad*, *Lamb's Lettuce*, and *White Pot-herb*. Lambs are said to be fond of them as food and *Lactuca agnina* is an old name for these plants.

The species are not easy to discriminate, differing most fundamentally in their minute fruits, the chamber containing the seed having a corky back in *V. olitoria* Pollich, and the empty chambers being either larger than this fertile one, or, as in *V. dentata* Pollich—the subject of our Plate—much smaller. The toothed bases of the leaves are a more recognisable, but less positively distinctive, character.

CCLXXV.—THE COMMON TEAZLE.

Dipsacus sylvestris Hudson.

THE Family *Dipsacæ* comprises some 150 species in ten genera. They belong mainly to the North Temperate region of the Old World ; and are biennial or perennial herbs with opposite, exstipulate leaves ; small flowers collected into capitulate inflorescences surrounded by an involucre ; an epicalyx or involucl, in most genera, enclosing the base of each flower ; unequal, imbricate corolla-lobes ; four free stamens ; and a one-chambered ovary formed from two carpels and containing a single pendulous albuminous seed. That the inflorescence is really cymose is seen by the order in which the florets open not being strictly centripetal. The epicalyx or involucl is apparently formed by the cohesion of two bracteoles. The lobes of the calyx and corolla, though normally each five in number, are sometimes four from union between two of them ; and the flowers are seldom polysymmetric. The dense capitulate inflorescences at once suggest the great Family *Compositæ* ; but are readily distinguished by the absence of any union between the anthers. The flowers are usually protandrous and secrete honey from an epigynous disk, while it is more or less concealed in the tube of the corolla.

There are three British genera in the Family—*Dipsacus*, *Scabiosa*, and *Knautia*—though several others occur as casual escapes from cultivation, a considerable number of members of the Family being of value in the flower garden. There are about a dozen species in the genus *Dipsacus*, all of them erect biennial plants with angular, prickly, or hairy stems ; with at least their upper leaves united in pairs at their bases ; with a columnar common receptacle to the flower-head and a spinescent bract below each flower ; with a four-angled involucl ; and with a four-lobed corolla. It is, no doubt, to the water-filled moat formed round their stems by the connate bases of their cauline leaves that the plants owe the name *Dipsacus*, the Δίψακος, *Dipsakos*, of Dioscorides, from διψάω, *dipsao*, I thirst. There can be no question that these successive obstacles must prove an effective barrier against most small crawling animals which might otherwise ascend the stem. The water in the moats is merely rain-water : it is not excreted by the plant ; but may possibly be to some extent absorbed by it in dry weather. Moths and other insects are commonly found drowned in it ; but there is no satisfactory evidence that the plant digests these or even absorbs the products of their decay. Protoplasmic threads supposed to be emitted from the surface of the stem within these moats were probably only some clinging protozoan. At the same time, these striking structures not only suggested names but also uses for the plant. Dr. Prior cites a Greek name Ἀφροδίτης λουτρόν, *Aphrodites loutron*, the bath of Aphrodite ; and Turner, in his “*Libellus*” (1538), writes :—

“*Dipsacos* latine labrum veneris aut lauacrum veneris dicitur, officine hanc herbam uirgam pastoris uocant, anglorum uulgus a wyldc tasyll.”

“*Dipsacos* is called in Latin the basin or laver of Venus : officinally they call this herb Shepherd’s rod : the common people of England [call it] a wild tasyll.”



THE COMMON TEAZLE—continued.

To this Ray adds the explanation that the water was used “ad verrucas abigendas,” to remove warts and freckles. It is, however, difficult to imagine it to have any efficacy.

As to our common English name for these plants it goes back to a considerable antiquity, the Old English *tæsan*, to tease, giving us metaphorically *tæsel*, while such entries as “*Virga pastoris*, wilde tesel,” and “*Carduus*, tasyllle,” occur in thirteenth and fifteenth century vocabularies. They refer, of course, to the use of *Dipsacus fullonum* Linné, the “Manured or Fuller’s Teazle,” in the “carding” of cloth, “card” in the sense of comb being said to be a word of Celtic origin. In this long-cultivated species, which it has even been suggested is but an improved form of *D. sylvestris* Hudson, and which is unknown in a wild state, the heads are cylindrical and the spinous floral bracts are recurved. They combine just the right degree of strength and elasticity to raise the desired nap on the surface of cloth, so that they cannot be adequately replaced by artificial means, though now fixed in numbers on a gig-mill where formerly they were applied by hand. In his “Survey of London” (1598), Stow says that in Moorfields there is

“a large close, called Tasel Close sometime, for that there were tassels planted for the use of cloth-workers.”

The crop is, however, an exhausting one for the soil and, perhaps, for that reason, we have been chiefly content to import our Teazles from France.

In our common wild species, *Dipsacus sylvestris* Hudson, the flower-heads are more conical or ovate and the floral bracts, though stiff, are straight. In the early part of the year its rosettes of radical leaves are conspicuous, as with a bright green colour and a serrate margin they also present a double row of stiff spinous prominences down their spreading blades. These radical leaves disappear before the second year’s growth. There are also prickles along the midrib on the under surface, apparently a very effective protection against browsing animals.

When the stiffly erect and branching stem has grown to its full height of from three to six feet, the opening of the lilac blossoms is also a striking sight in our country hedgerows and waste-places on moist clays and loams in August and September. The long spinous involucral bracts sweep upward as high as the top of the flower-head: a band of blossoms expands round the middle of the flower-head, first putting forth their slender stamens and the stigmas later; this is followed by two parallel bands, and the opening then proceeds from these both downwards and upwards, while bees eagerly probe the corolla-tubes for their honey.

The tall plant with its heavy heads of flowers or fruit becomes more firmly anchored in the soil by a remarkable alternate expansion and contraction of its stout roots, as a result of which their surface becomes much wrinkled transversely.

CCLXXVI.—THE FIELD SCABIOUS.

Knautia arvensis Coulter.

OF the large Old World genus *Scabiosa*, so named by Brunfels from its supposed value as a remedy for leprosy (*scabies*), we have only two British species out of a total of about eighty. They are perennial plants with round stems ; entire or pinnatifid leaves ; hemispherical flower-heads with a cylindrical scaly common receptacle ; an eight-angled involucre ; and a calyx with four or five persistent bristly teeth.

The pretty little Devil's-bit Scabious (*Scabiosa Succisa* Linné), the slender-stalked globose heads of bluish-purple flowers of which are so common on heathy places in late summer, gets its name—the mediæval *Morsus diaboli*—from its premorse or truncated rhizome.

“ Fabulous antiquity,” says Parkinson, “ the Monkes and Fryers, as I suppose, being the first inventors of the Fable, said, that the Devill envying the good that this herbe might do to mankinde, bit away part of the roote, and thereof came the name *Succisa*, Devil's bit.”

The other, Small Scabious (*S. Columbaria* Linné), with pinnatifid cauline leaves, supposed to resemble a dove's foot, is less common, and occurs especially on a calcareous soil. It has flatter heads of lilac flowers, differing both from the Devil's-bit and from the Field Scabious in having a five-lobed corolla.

One or two other species, including the striking Mourning Widow (*S. atropurpurea* Linné), with all its leaves deeply cut and large heads of chocolate-brown or almost black flowers studded with white anthers, occur as escapes from cultivation.

As large, as common, and as beautiful as any of the true Scabiouses, however, is the Field Scabious (*Knautia arvensis* Coulter), which is separated into another genus only on small technical grounds of structure. Rejoicing, like *Scabiosa Columbaria* Linné, in a calcareous soil, but apparently requiring rather the dry porous character of such soil than its lime, since it often occurs also on non-calcareous ground, the Field Scabious seems a child of the sun of late summer. The dry, dusty road-bank is not too dry, nor the bare chalk-pit too poor, for it. In a chance shade its flowers may pale almost to white ; but in the full sun of the cornfield they deepen from lavender to a richer and warmer hue—a shade of heliotrope possessed by very few other British wild flowers.

Linnæus left it in the genus *Scabiosa* ; but Coulter, in his monograph of the Family, in 1823, placed it in the genus *Knautia*, dedicated to the memory of Christian Knaut, a Saxon botanist, who died in 1716, the year in which his chief work—a “ *Methodus plantarum* ”—was published. Its distinctive characters as a genus are that the common receptacle is hemispherical rather than cylindrical and is hairy ; that the involucre is four-angled ; and that the limb of the calyx consists of from eight to sixteen deciduous bristles. Our species (*K. arvensis* Coulter) has a stout rhizome and stalked, lanceolate, serrate but generally undivided radical leaves. Its



THE FIELD SCABIOUS—continued.

stem rises from two to three feet, usually branching to some extent in its upper part and bearing successive pairs of large, deeply-cut pinnatifid leaves, presenting considerable variety of outline. The whole plant is very hairy, three different kinds of hairs occurring together. The stem is generally bristly, though not quite as rough as that of the Viper's Bugloss, having long hairs, each springing from a dark base. There are also long, silky, simple hairs and a pubescence of close-set shorter ones. In spite of this, sheep and goats are said to eat the plant, though it has a bitter flavour which causes cows and horses to refuse it.

The flower-heads, rising on long rounded and somewhat slender stalks, are often nearly two inches across and are surrounded by two whorls of broad, ovate-lanceolate, leafy, involucral bracts, the "common calyx," as it was unhappily termed by Linnæus. The involucels, springing from the circumference of the inferior ovaries, are silky and slightly four-toothed above; and the corolla itself is also hairy on the outside, besides having hairs lining its tube and so protecting the honey from rain and from the smaller unwelcome insect-visitors. Though the florets towards the centre of the head are nearly polysymmetric, their outermost lobe is slightly larger than the other three, and this want of symmetry increases towards the circumference of the flower-head, so that the outermost florets are much larger and irregularly radiant. This is, perhaps, one of the most striking features of the plant. In some individuals, some of the flowers have imperfect anthers and are thus female in function, this being especially the case early in the season. Ordinarily the yellow anthers mature in succession, but all in advance of the stigmas. The stamens stand up, when the flowers first open, at a height of four or five millimetres above the corolla; and they take several days before they have completely discharged all their pollen. Meanwhile the style remains short, so that the immature stigma is within the corolla. The flowers open from the circumference to the centre of the head; but in this way the whole inflorescence is functionally first male and afterwards female. When the anthers are empty and have withered, the style elongates, so that the stigma occupies their former position. Self-pollination seems to be, therefore, wellnigh impossible; but the flowers have a decided, though delicate, perfume, and this and their conspicuous colouring are effective advertisements of their stores of honey, so that they are visited by a very great variety of insects and seem to set an abundance of seed. Though the five long, bristle-like teeth of the calyx are deciduous, its tube persists as a beak to the fruit.

Amid the suggestions of dry heat in the yellowing corn, with the glare of scarlet poppies to intensify our feeling of the sun in its power, the lavender tints of this fellow-denizen of the cornfield, admirably contrasting with their own greens, give an impression of coolness, though with a sense of vigour which is absent from the pallid blossoms of the whiter specimens of the small Field Bindweed. The uncommon colour makes the Scabious a welcome addition to a nosegay.

CCLXXVII.—THE CLUSTERED BELL-FLOWER.

Campanula glomerata Linné.

THE regrettable ambiguity of the name *Aggregatæ* for a Natural Order is not greater than that which attaches to the name *Campanulatæ*, which Engler applies to the last and presumably the highest of his Orders. He uses it to include six Families, namely the *Cucurbitaceæ*, *Campanulaceæ*, *Goodeniaceæ*, *Candolleaceæ*, *Calyceraceæ*, and *Compositæ*. Eichler and Warming's *Campanulinæ* does not include these last two Families ; and Bentham and Hooker's *Campanales* includes only the *Campanulaceæ*, *Goodeniaceæ*, and *Stylidiæ*, which last is a synonym for *Candolleaceæ*.

We have already given our reasons for treating *Bryonia dioica* Jacquin, the one British representative of the Cucumber Family, in a very different part of the series. Leaving that group, therefore, out of consideration, we may describe the Order *Campanulatæ*—Engler's Order, that is—as mostly herbaceous plants with scattered, simple, exstipulate leaves ; pentamerous flowers ; valvate æstivation ; five stamens with their anthers close together or united ; and an inferior ovary of five, or more frequently a smaller number of carpels, with many ovules in each chamber, or few, or only one. Among British plants we have only to consider the two Families *Campanulaceæ* and *Compositæ*.

The *Campanulaceæ*, or Bell-flower Family, are a considerable group, comprising upwards of a thousand species in some sixty genera. Though represented in all regions, they are most abundant in the Temperate and Sub-tropical parts of the Northern Hemisphere. In Europe there are twelve genera and about 150 species, of which six genera and fourteen species are British. Most members of the Family have a bitter, acrid, milky juice or latex : their inflorescences are most generally racemose ; and their flowers blue, white, or rarely red, and either large and conspicuous, or massed together in crowded inflorescences. The flowers are usually perfect and polysymmetric, with the odd sepal posterior : the calyx superior and persistent ; and the corolla also persisting, in a withered condition, in the fruit stage. The anthers are introrse and protandrous, and the bases of the filaments are often so dilated as to cover over the honey secreted by the epigynous disk. There are eight, five, three, or two carpels, and the same number of chambers to the ovary, with axile placentation, and a number of minute anatropous ovules in each chamber ; only a single style, covered with collecting hairs ; and as many lobes to the stigma as there are carpels. The fruit is usually a dry dehiscent capsule and the seeds are albuminous.

Many members of the Family are valued for their beauty in our gardens, as well as among our wild flowers ; but few of them are applied to any industrial purposes. Apart from their beauty, they, however, possess considerable interest for the botanist in exhibiting transitions towards the high type of the *Compositæ*. The milky latex naturally suggests an especial affinity with the Sub-Family *Ligulifloræ* in the latter. Whilst there are considerable resemblances between the two Families in



THE CLUSTERED BELL-FLOWER—continued.

their vegetative characters, it is in the floral mechanism that the more interesting transitions occur. The large blue pendulous flowers of many species of the genus *Campanula* itself at once suggest that they are adapted to the visits of bees ; but the smaller massed flowers of such plants as the Sheep's-bit (*Jasione*) and the Rampions (*Phyteuma*) are nearer to the type of the *Compositæ*, with a great variety of insect-visitors. At the same time, the rarity of the primitive yellow colour in their flowers indicates that in some respects the *Campanulaceæ* represent a higher floral grade than the majority of *Compositæ*. Though the flowers are markedly protandrous, and the hairy style serves only to collect pollen for insect conveyance to other flowers while its stigmas are closed together and non-receptive, at a much later stage the stigmas bend back among the hairs on the style to which some of the flower's own pollen may yet cling ; and, in this way, and by the collapse upon the essential organs of the withering corolla, self-pollination is effected, if cross-pollination has not occurred.

The British genera of the Family fall into two Sub-Families : the *Campanuloideæ*, mostly with polysymmetric flowers and free anthers, to which belong *Campanula*, *Phyteuma*, *Wahlenbergia*, and *Jasione* ; and the *Lobelioideæ*, containing only two British species of *Lobelia*, with monosymmetric flowers and united anthers.

Of the 240 species of the genus *Campanula*, 94 are European and seven are British. The genus may be briefly characterised as having polysymmetric pentamerous flowers with a slightly-lobed bell-shaped corolla, generally violet, blue, or white, and a short, broad ovary dehiscing by lateral pores below the lobes of the calyx. Among the species of this genus there are, as we shall see, considerable differences in the adaptation of the flower for the protection of its honey and in those of the fruit for the dispersal of the seed.

The very handsome Clustered Bell-flower (*Campanula glomerata* Linné), one of the few British wild flowers which we have been content to transfer unaltered to our gardens, has its deep purple blossoms crowded, sessile, or nearly so, and erect, mostly at the apex of the short stem. To protect their honey, these flowers close at night, or in wet weather. Similarly the capsules are produced in an erect position and open by valves near their base.

The plant occurs in dry sunny places, chiefly in pastures on a limestone soil, flowering from July to October. At the Bartlow Hills, near the Cambridgeshire border of Essex, which tradition alleges to have been thrown up in commemoration of a battle between Cnut and Edmund Ironsides, this plant shares with two other not generally distributed species, *Anemone Pulsatilla* Linné and *Sambucus Ebulus* Linné, the name of *Danes' blood*.

CCLXXVIII.—THE HARE-BELL.

Campanula rotundifolia Linné.

Professor Daniel Oliver has described how when he came to examine Professor J. S. Henslow's manuscripts for the preparation of his "Lessons in Elementary Botany" he found

"a lesson in pneumatics *apropos* of pop-guns, made from the stem of the Elder; an account of soap-making . . . in connexion with the Olive . . . ; an account of wonderful bells, under the Bell-flowers; of glass-making, under the Saltworts," etc.;

and we have before us some sheets from Henslow's herbarium which illustrate this same practice of instructive digression, a print of the great bell of Moscow, for instance, appearing alongside dried specimens of the genus *Campanula*. Nor, when we see the beautiful symmetry of the flowers of the various species of this attractive genus, can we wonder at their suggestion of such lessons or of the names by which these plants are known in all languages.

There are species, such as *Campanula patula* Linné, in which the flowers are erect, like those of *C. glomerata* Linné, during the day; but, being, unlike those of the last-named species, on long slender stalks, are able to hang downwards at night or in wet weather, so as to protect their honey; and there are others, still more suggestive of the bells of man's making, that are always hanging. Such are the Canterbury Bell (*C. Trachelium* Linné) and the Hare-bell (*C. rotundifolia* Linné). Gerard speaks of the former as growing

"in the lowe woods and hedgerows of Kent about Canterburie";

and Messrs. Britten and Holland quote an interesting letter to a newspaper suggesting that originally bells were worn by horses merely to give timely notice of their approach when roads like the Pilgrims' Way were too narrow to allow of passing; but that at an early date the use of such bells strapped to a horse's collar became specially associated with pilgrims to the shrine of St. Thomas of Canterbury, specimens being in existence bearing the inscription "Campana Thome."

As to the name *Hare-bell*, there has been much discussion, some very plausibly maintaining that the delicate pedicels of *Campanula rotundifolia* suggest that the name should be *Hair-bell*, while in Scotland the name is given to the Wild Hyacinth. Thus it comes about that while we sometimes give our Hare-bell the explanatory name of the *Blue-bell of Scotland*, it is known in Germany as *Englische Hyacinthe*. The hare is, however, associated with dry, open, heathy places, such as those in which the Hare-bell delights; and, in Germany at least, also with the equally timid night-folk that haunt the same spots—the fairies—to whom the flower owes its French name of *Clochette de fée*. Though the suggestion of a bell would seem the most obvious, and has given us Dodoens's Latin diminutive *Campanula*, these plants bear other popular names of quite distinct reference. Such are *Throatwort*,



THE HARE-BELL—continued.

translating the Latin *Trachelium*, *Uvularia*, and *Cervicaria*, and referring to the use of a decoction of the Canterbury Bell, according to the doctrine of signatures—it having a wide-throated flower—as a gargle for the throat ; and the more purely fanciful *Our Lady's Thimble* or *Fairy Thimbles* for the Hare-bells.

To the casual observer no name can well seem less appropriate than the specific *rotundifolia* as applied to the Hare-bell, the only leaves to be seen on which are often the narrow linear ones on the stem. Radical leaves, however, occur, as is well seen when the plant is grown in garden soil free from the competition of grasses, and also in the earlier stages of its growth in a wild state ; and these are often much rounder than those on our Plate. Linné is said to have noticed these rounded root-leaves on the plant as it grew in the crevices of the steps of the university at Upsala.

While, as in other genera, we may trace one general scheme of floral mechanism, or of that for seed-dispersal, running, with merely slight specific differences, through a whole genus, it is interesting in the case of a large genus, such as *Campanula*, or rather in one having a considerable number of British species, to notice the varied adaptations that the different species have taken on in the matter of habitat. In our flora we have none of the truly alpine species, with stunted habit, and flowers appearing disproportionately large, even for this large-flowered genus, which are numerous in Central Europe and are now grown in our rock-gardens. *C. glomerata* Linné is, as we have seen, mainly an inhabitant of open sunny spots on a calcareous soil. *C. Trachelium* Linné likes the shade of a thick hedgerow or thicket, and has much the same preference for a calcareous soil ; but is not confined to it, so that it would seem that many, if not most, of these plants with large blue bee-pollinated flowers require a warm, dry, or well-drained soil, not acid in reaction, rather than one necessarily calcareous. The Hare-bell, for instance, is, perhaps, generally associated in our minds with open sunny heaths on a siliceous soil and often at a considerable altitude. It will grow, however, on chalk, gravel, loam, or even clay : it is often found in soil at least temporarily damp and in quite lowland situations. At the same time, it is not easy to explain its complete absence from certain areas.

The jocund beauty of its bells as they swing in the breeze seems to justify Erasmus Darwin's poetical, if most unscientific, suggestion that butterflies were flowers that had attained Galatea-like to a higher separate existence. So closely do they match the beautiful little insects that flutter amongst them that most of us in memories of the past can endorse Heber's apostrophe :—

“With drooping bells of clearest blue
Thou didst attract my childish view,
Almost resembling
The azure butterflies that flew
Where on the heath thy blossoms grew
So lightly trembling.”

CCLXXIX.—THE IVY-LEAVED BELL-FLOWER.

Wahlenbergia hederacea H. G. L. Reichenbach.

SO various are the attractions of the Vegetable Kingdom that they arouse in us very different emotions. We may experience a feeling of awe in the presence of the majestic Sequoia as if solitary amid the grandeur of lofty mountains : a sheet of colour spread before our eyes in a field of poppies, or an alpine slope covered with gentian gives us a simple feeling of pleasure to a single sense : in a perfect rose, or some large gay, bizarre, and, perhaps, fragrant, exotic orchid we get a more complex sense of beauty of colour, form, and perfume combined. The gardener may despise a tiny wild flower as “only of botanical interest” ; but it is difficult to imagine that any seeing eye can apply any epithet short of exquisite to such a floral jewel in daintiest setting as the Ivy-leaved Bell-flower.

It is the only British species of its genus ; but that genus differs but in one character from *Campanula* and that by no means a prominent one. *Wahlenbergia* was so named by Schrader in 1814, in honour of Göran Wahlenberg, born in 1780, who sat in the chair of Linnæus and published Floras of Lapland and Upsala before his death in 1851. It includes some eighty species, mostly natives of southern Temperate regions, where to a great extent they may be said to replace the genus *Campanula*. In the mountains and meadows of New Zealand and Australia two species are known as “Blue-bell” and as “Hare-bell” ; and a hardy annual from South Africa, and half a dozen tufted perennial rock-plants from south-eastern Europe, represent the genus in our gardens. With blue, white, or purplish blossoms—bell-shaped, tubular, or rotate—they differ from *Campanula* only in the ovary and the resultant fruit. The ovary is half-superior and the capsule dehisces loculicidally by valves above or between the segments of the calyx.

No species in the genus can be more beautiful than our Ivy-leaved Bell-flower (*Wahlenbergia hederacea* H. G. L. Reichenbach), and we can well imagine the delight with which that “worthy and industrious Gentleman and Herbarist Mr. George Bowles” must have first seen it when he discovered it in 1632

“in Montgomerieshire on the dry bankes in the high-way as one rideth from Dolgeogg . . . unto a market toune called Mahuntleth and in all the way from thence to the sea side.”

We would gladly know more than we do of Mr. George Bowles. He appears to have lived at Chislehurst and to have been the first to record *Teesdalia*, *Impatiens Noli-tangere*, and the Great Sea Stock (*Matthiola sinuata*) as British ; and the above is the language of Parkinson in 1640 and of Thomas Johnson, when, in 1633, he prints the first account of this little plant, under the name *Campanula Cymbalariae foliis*, in his edition of Gerard’s “Herball.”

The tiny translucent leaves of this little Bell-flower, though with none of their thick fleshy texture and not a quarter their size, are certainly of the same form as those of *Linaria Cymbalaria* Miller, the Ivy-leaved Toadflax, so that John Bauhin



THE IVY-LEAVED BELL-FLOWER—continued.

might well call it *Campanula folio hederaceo*, Ivy-leaved Bell-flower, a name which How in his "Phytologia Britannica" of 1650 shortened into *Ivy Bells*, a pretty form that has never become current. It is difficult to realise that the slender stem creeping amongst *Sphagnum* or grass is perennial ; and it appears as if the thread-like peduncle could hardly bear aloft the weight of the little blue bell, now drooping, now erect, but held up well above the leaves and even above the general surface of the surrounding ground vegetation. The whole plant is generally glabrous : its tiny stalked leaves mostly rest upon the neighbouring plants ; and the flower-buds droop until they have opened, fully bending back the broad but short-pointed lobes of the corolla which are traversed by veins of a slightly deeper blue. The style secretes a viscid fluid to which the pollen from the protandrous stamens adheres ; and after this has been discharged the anthers wither, leaving the broad bases of the filaments to protect the honey. Though there is but one flower on each peduncle, a large number is generally produced ; and the sub-globose capsules that succeed them, crowned with the awl-shaped calyx-teeth, yield a plentiful supply of seed. Though these capsules open by three valves, there are also indications of large pores, visible even in dried specimens, but never opening. The minute seeds are numerous in each capsule.

It is strange that Johnson, in recording the first finding of this plant, should have spoken of dry banks, for it is most essentially a lover of the damp. Many writers have dwelt on its greater prevalence in the moist air of the west and especially in upland bogs ; but we have found it in profusion in marshy ground and in damp woods in Sussex, growing with the Lesser Skull-cap (*Scutellaria minor* Hudson) and making even the pale pink, but slightly more opaque, blossoms, and the leaves, of that delicate little species appear coarse in comparison. One of the most beautiful sights in our memory was, however, in the west, when by a clear rill over granite sand on the plateau of Dartmoor, against a background of pale green bog-moss, we saw the delicate blue bells of this plant, with the equally delicate pink ones of the Bog Pimpernel, surrounding scattered rosettes of the Sundew, its leaves glittering like diamonds in the sunshine. On the dark peat in the crater-like hollows of Plinlimmon, near the sources of the Severn ; or with Bog Asphodel and Marsh St. John's-wort in the mossy glens of Exmoor, it may equally be seen in beauty unsurpassed by any of its larger neighbours. As Linné owned himself enraptured by *Linnæa* and the Chickweed Wintergreen (*Trientalis europæa*) and Smith owned his partiality for the sunset tints of the Water Avens, we can well imagine any botanist rising superior to the attractions of mere size and proclaiming his allegiance to the Ivy-leaved Bell-flower as to the queen of his affections.

CCLXXX.—ANALYTICAL DRAWINGS OF THE VALERIAN, TEAZLE, AND BELL-FLOWER FAMILIES.

(*Valerianaceæ*, *Dipsacæ*, and *Campanulaceæ*.)

THIS Plate contains analyses of all the species represented in the three Families that have been the subjects of the preceding six Plates.

Valerianella dentata Pollich, our sole representative of the Family *Valerianaceæ*, is the subject of the first line of figures. Fig. 1 is a flower as seen from above and of natural size ; Fig. 2, the same seen laterally so as to show the calyx ; Fig. 3, the same enlarged, with bract ; Fig. 4, two clusters of fruits with the one terminating the axis below ; Fig. 5, a single fruit ; and Fig. 6, the same from another aspect, which, with Fig. 7, a cross section of the same, shows the one seed-bearing chamber and the two external ribs characteristic of the species.

The second line of figures are those of the Common Teazle (*Dipsacus sylvestris* Hudson), Fig. 1 being a single flower, enlarged, with its floral bract ; Fig. 2, a stamen ; Fig. 3, the ovary with involucre and calyx, natural size ; Fig. 4, the entire gynæceum, with four-angled involucre, enlarged ; Fig. 5, the fruit cut vertically, also enlarged, showing embryo (cotyledons) and albumen ; and Fig. 6, below, a fruit, slightly magnified.

The third line represents the Field Scabious (*Knautia arvensis* Coulter), Fig. 1 being the leafy involucre, seen from below and of natural size ; Fig. 2, one of the outer florets seen from the front and enlarged ; Fig. 3, the same in longitudinal median section, seen, therefore, laterally and rather more enlarged, with a bract ; Fig. 4, one of the more central florets, enlarged ; and Fig. 5, a fruit cut vertically and showing the involucre and calyx, embryo (cotyledons), and albumen, enlarged.

The fourth line of figures represents the Clustered Bell-flower (*Campanula glomerata* Linné), Fig. 1 being one of the erect flowers seen laterally and of natural size ; Fig. 2, a stamen showing the dilated base of its filament ; Fig. 3, the andræcium, calyx and corolla being cut away ; Fig. 4, the flower, with only the corolla removed, when the anthers are withering and the stigmatic lobes are becoming recurved ; and Fig. 5, a fruit in longitudinal section showing the central placentation, numerous seeds, and persistent sepals, but not the withered corolla. All these figures are approximately of natural size.

The fifth line represents the Hare-bell (*Campanula rotundifolia* Linné), Fig. 1 being a flower seen from the mouth of the corolla ; Fig. 2, the same seen vertically, but with an exceptionally exerted style ; Fig. 3, the withered flower in the fruit stage ; Fig. 4, the essential organs before the stigmatic lobes become recurved ; Fig. 5, a stamen ; and Fig. 6, a stamen and the style, with its base hidden by that of another stamen. These six figures are about natural size. Fig. 7 is a transverse section of the fruit. It is three-chambered, the central placental column sending



ANALYTICAL DRAWINGS OF THE VALERIAN, TEAZLE, AND BELL-FLOWER FAMILIES—continued.

out a dilating placental cushion into each chamber on the surface of which are numerous seeds.

The last line represents the Ivy-leaved Bell-flower (*Wahlenbergia hederacea* H. G. L. Reichenbach), Fig. 1 being a flower seen laterally and of natural size ; Fig. 2, the corolla opened and enlarged ; Fig. 3, the flower with the corolla removed, similarly enlarged, before the stigmatic lobes have curved outward ; and Fig. 4, a young capsule, seen in section and enlarged.

Mention may be made here of another member of the Family *Campanulaceæ*, which we have been unable to include among our drawings, but which is so unlike the rest of the Family, or at least its other British representatives, that it frequently causes difficulty to the beginner. This is *Venus's Looking-glass* (*Legousia hybrida* Delabre), otherwise known as *Campanula hybrida* Linné or as *Specularia hybrida* A. De Candolle. It is a small erect plant, seldom a foot high and generally unbranched, occurring as an annual weed in cornfields, chiefly on a chalk soil, in the south of England. It has a tough angular stem ; oblong cauline leaves ; and a terminal erect flower. The inferior ovary forms a pod-like triangular structure below the flower, surmounted by a green calyx, with teeth much longer than the petals and a rotate deep purple corolla, much the colour of *Campanula glomerata*, but in its size and form recalling the Pimpernels. The long capsule dehisces by pores near its apex.

CCLXXXI.—THE HEMP AGRIMONY.

Eupatorium cannabinum Linné.

THE Family *Compositæ* is the largest among Flowering Plants, comprising upwards of eleven thousand species in more than eight hundred genera. These species are distributed into almost every part of the globe; and, though the great majority of them are herbaceous, some occur socially, or, at least, in great numbers. With prodigious powers of multiplication, and excellent seed-dispersal mechanism, they readily occupy new ground. Though the Family includes very few epiphytes, few climbers, and far more distinctly xerophytic forms than it does aquatic or semi-aquatic types, some of its members have adapted themselves to almost every kind of environment; so that the Family is probably both the most dominant and the most aggressive in the Vegetable Kingdom. At the same time, the Family is clearly defined, its most nearly related Families being the small South American group the *Calyceraceæ*, with a leafy calyx, united filaments, generally free anthers, and an albuminous seed, and the *Dipsaceæ*, which have, as we have seen, four free stamens and albuminous seeds. As is the general rule with the largest and most dominant Families, such as *Cruciferae*, *Umbelliferae*, *Leguminosæ*, *Orchidaceæ*, etc., the structural type within the Family is, on the whole, very uniform, so that the discrimination of its genera and their grouping into Tribes is dependent upon minute characters not very easily recognisable.

The vegetative characters do not seem to exhibit very great specialisation, the leaves, for example, being mostly simple and exstipulate; but both in flower and fruit we find types, at once uniform and (in detail) varied, of a very high grade. These have probably secured the success of the Family throughout the world; and this universal distribution, aggressiveness, general dominance, complex organisation, special adaptation, and success justify us in considering the Family as the highest in the Vegetable Kingdom.

There is generally a tap-root: the leaves are mostly scattered, simple, and exstipulate; and the flowers are very small but are collected on a common receptacle into centripetal capitula, surrounded by an involucre. The individual flowers, or *florets*, as they are called, are pentamerous, with a superior calyx with but little development of its limb in the flower-stage; a valvate corolla; five epipetalous stamens with free filaments and syngenesious, introrse, protandrous anthers; and a one-chambered ovary, formed from two carpels, surmounted by a style bifurcating into two stigmatic lobes (one anterior and the other posterior) and containing one basal, erect, anatropous ovule, which becomes an exalbuminous seed. The small, dry, nut-like indehiscent fruit is often crowned with a pappus, representing the limb of the calyx and assisting in dispersal.

Postponing further discussion of the variations and advantages of this type of structure, we must mention here that the Family falls naturally into two



THE HEMP AGRIMONY—continued.

Sub-Families, the *Tubulifloræ* and the *Ligulifloræ*. In the former there is no milky latex, and the centre florets of the capitula at least are polysymmetric and tubular : in the latter there is a white milky latex and all the florets are ligulate, *i.e.* have a strap-shaped monosymmetric corolla.

Hoffmann recognises thirteen Tribes, of which twelve belong to the *Tubulifloræ*. Of our forty-eight British genera, thirty-four belong to the *Tubulifloræ*, fourteen to the *Ligulifloræ*. Of these thirteen Tribes, eight have British representatives.

The Hemp Agrimony (*Eupatorium cannabinum* Linné) is the only species, out of four hundred in the genus, to occur in Britain, most of the others being American ; and the genus is the only British one belonging to the Tribe *Eupatorieæ*. It is a downy perennial plant with a stem three to six feet high, woody at its base and tinged with red. The leaves are opposite and are divided palmately into from three to five lanceolate-serrate lobes. The resemblance of these leaves to those of the Hemp (*Cannabis sativa* Linné) gives the plant its specific name *cannabinum* and the prefix to its English name.

The dull lilac florets are collected into small heads, each containing about five florets on a flat, naked, common receptacle, surrounded by about ten obtuse, oblong involucral bracts in two whorls, of which the outer is shorter. These small heads are collected into large terminal corymbs and are thus very conspicuous objects, more especially as the plant often occurs in extensive masses by the sides of streams or ponds. The flowers are all alike, perfect, and protandrous. The corolla is four and a half millimetres long, tubular below, and expanded in its upper half into a bell. The tube of united anthers is included within this bell ; but they burst inwards before the flower opens, and, as it does so, the downy style grows up through the tube of anthers, sweeping out their pollen, and then bifurcates into two arms as long as the corolla-tube, only the inner surface of the lower part of this fork being stigmatic. Honey is secreted at the base of the corolla-tube, and the flower-heads are chiefly visited by butterflies. The angular fruits are crowned by a white pappus of a single circle of hairs.

The plant is slightly aromatic and is reputed to have tonic properties ; but if this was one of the medicinal discoveries of King Mithradates Eupator, as its ancient generic name suggests, it was not one to be very proud of. Having a coloured flower it was, perhaps, considered more dignified than common Hemp, and, according to an old manuscript in the Bodleian Library,

“Cannabis agria : holi-roppe [holy rope] is lyke hempe & hit growes in watry places.”

Dr. Prior suggests that it was reputed to have furnished the rope employed in the Passion. The plant is not particularly tough or fibrous.

CCLXXXII.—THE DAISY.

Bellis perennis Linné.

THOUGH the Golden-rod (*Solidago Virgaurea* Linné), the Sea Starwort (*Aster Tripolium* Linné), and others also represent the Tribe *Astereæ* among British *Compositæ*, the only one of the group we have here is that

“unassuming Commonplace
Of Nature,”

as Wordsworth terms it, the Daisy.

Unknown apparently to the Greek botanists, we first meet with it in Pliny, under the name *Bellis*, from *bellus*, pretty, though a mediæval piece of pseudo-Classical mythology invented a Dryad named Belides, admired by Vertumnus, the god of autumn, and changed into this flower to escape him. Pliny, as translated by Holland, calls it “a white floure partly inclining to red,” a flower of the meadow, with a yellow cup “crowned, as it were, with a garland, consisting of five and fifty little leaves, set round about it in manner of fine pales.”

The early season of the year at which this hardy little perennial comes into flower gave it, no doubt, its French names of *Pasquerette* or *Pâquerette*, little Easter-flower, and may have led to its association with the feast of St. Margaret of Cortona on February 22nd. In German it is known both as *Marienblume* and as *Margarethenblume*; in Italian it is *Margherita*; and in French *Marguerite* became its most frequent name. It thus became associated with the pretty name, originally meaning a pearl, not only in the poetry of Chaucer, but also in the heraldic cognisances of many of the royal Margarets of the Middle Ages, of Margaret of Provence (wife of St. Louis), Margaret of Valois, Margaret of Anjou, and Margaret of Richmond, who bore three Daisies on a green turf.

Our ancestors in this country may have been the more impressed by the unfolding of the involucre and its enclosed florets at early dawn, so that we have the Old English *Daeges eage*, the unquestionable origin, as Chaucer notes, of *Daisy*, and its Welsh equivalent *Llygady dydd*. It has even been claimed for Chaucer that he was the first to note what Linnæus termed the *horologium floræ*, the opening and closing of flowers at particular hours. Nothing certainly can well exceed his cult for this humble blossom, which is mainly set forth in his “Legend of Good Women” :—

“Of all the floures in the mede,
Then love I most those floures white and redde ;
Such that men callen Daisies in our town.
To them I have so great affection,
As I said erst when comen is the Maye,
That in my bedde there dawneth me no daie,
That I n'am up and walking in the mede
To see this floure against the sunne sprede.
When it upriseth early by the morrow,
. . . she that is of all floures the floure,
Fulfilled of all virtue and honoure ;



THE DAISY—continued.

And ever alike fair and fresh of hewe,
As well in winter as in summer newe,
As soon as ever the Sunne ginneth west
To sene this floure, how it will go to rest,
For fear of night so hateth she darknesse
Her chere is plainly spread in the brightnesse
Of the Sunne, for there it will unclose.
Well by reason men it calle maie
The Daisie, or else the Eye of Daie."

It has been well said, however, that the poetical history of the Daisy not only begins with Chaucer but, for a time, wellnigh ends with him ; for it occupies but little place in the poetry of the sixteenth, seventeenth, and eighteenth centuries till the

"Wee, modest, crimson-tipped flower"

had the good fortune to be uprooted by Robert Burns's plough, which has made almost every subsequent British poet do it reverence. Clare, with characteristic observation, notes that

"Daisies button into buds" ;

and Wordsworth almost equals Chaucer in his praise of "The poet's darling." The sister arts also proclaim it. We have several times seen the ground sprouting daisies beneath the feet of some stately dame on a monumental brass of the Middle Ages ; and its star-like flower-heads adorn the foregrounds of several of the early Italian and Flemish painters, as, for instance, Jan Van Eyck's "Adoration of the Lamb" in the cathedral at Ghent.

It is difficult, therefore, to descend to one's own dull prose in dealing with this universal favourite ; so that, instead of so doing, we will quote a portion of Martyn's translation of one of the charming Letters on Botany by Jean Jacques Rousseau, written probably at Wootton in Derbyshire.

"Take," he says, "one of those little flowers, which cover all the pastures, and which every one knows by the name of Daisy. Look at it well, for I am sure you would never have guessed from its appearance that this flower, which is so small and delicate, is really composed of between two and three hundred other flowers, all of them perfect, that is, each of them having its corolla, stamens, pistil and fruit ; in a word, as perfect in its species as a flower of the hyacinth or lily. Every one of these leaves, which are white above and red underneath, and form a kind of crown round the flower, appearing to be nothing more than little petals, are in reality so many true flowers ; and every one of those tiny yellow things also which you see in the centre, and which at first you have perhaps taken for nothing but stamens, are real flowers. . . . Pull out one of the white leaves of the flower ; you will think at first that it is flat from one end to the other, but look carefully at the end by which it was fastened to the flower, and you will see that this end is not flat, but round and hollow in the form of a tube, and that a little thread ending in two horns issues from the tube. This thread is the forked style of the flower, which, as you now see, is flat only at the top. Next look at the little yellow things in the middle of the flower, and which, as I have told you, are all so many flowers ; if the flower is sufficiently advanced, you will see some of them open in the middle and even cut into several parts. These are monopetalous corollas, which expand ; and a glass will easily discover in them the pistil, and even the anthers with which it is surrounded. Commonly the yellow florets towards the centre are still rounded and closed. These, however, are flowers like the others, but not yet open ; for they expand successively from the edge inwards."

CCLXXXIII.—THE COMMON CUDWEED.

Filago germanica Linné.

WHEN words in ordinary use have been given a special technical sense, it is almost certain to lead to ambiguity. So when in Rousseau's simple but graphic description of a Daisy, which we have quoted, the tiny florets are stated to be each a perfect flower, the writer does not mean to imply that, in the technical meaning of the word "perfect," they all possess both stamens and carpels. As a matter of fact, in the Daisy, as, perhaps, in the majority of *Tubulifloræ*, the flowers are *gynomonæcious*, some female and others perfect, the arrangement general in this Sub-Family being that the outer or "ray" florets are female, *i.e.* have no stamens, while those in the centre or "disk" are perfect. Several other cases of sex-distribution in the flower-head occur among *Compositæ*, and Linné made use of this character as the chief means of subdividing his Class *Syngenesia*, which corresponds very nearly to our Natural Family *Compositæ*. Thus in the *Ligulifloræ*, in Hemp Agrimony, in the Bur-Marigolds, and in the Thistles, all the florets are perfect; in the Blue Cornflower and Knapweeds (*Centaurea*) the ray-florets are neuter and the disk-florets perfect; whilst in the Garden Marigold (*Calendula officinalis* Linné) we have the rare case of female ray-florets and male disk ones. This is physiologically the case also in the Edelweiss (*Leontopodium alpinum* Cassini), that near ally of the Cudweed—the subject of this Plate—in the foolhardy attempt to reach which on inaccessible places so many lives have been sacrificed in the Alps. In this plant the outer florets are female, while the inner ones have stamens and a style which serves to sweep out the pollen, but no stigma to receive that from other flowers. A similar arrangement occurs in the Butterburs (*Petasites*) and Coltsfoot (*Tussilago*).

The *Compositæ* are, perhaps, most developed in Temperate and Sub-tropical regions, rather than in polar or in moist low-lying Equatorial floras. They are estimated to constitute only 7 per cent. of the flora of Melville Island, but no less than $33\frac{1}{3}$ per cent. of that of the Chilian Andes. This being so, it is not surprising to find a large number of *Compositæ* specially adapted to dry conditions, and this is especially true of the Tribe *Inuleæ*. It includes the Everlastings of South Africa of the genus *Helichrysum*, of which 150 species—about half the genus—belong to that region, plants whose dry, paper-like flower-heads are well known to most people, the Edelweiss, the closely-allied genera *Filago* and *Gnaphalium*, *Inula* and *Pulicaria*.

The name *Filago*, used by Dodoens, is derived from the Latin *filum*, a thread; whilst *Gnaphalium* is Dioscorides's *Γνάφαλιον*, *Gnaphalion*, from *γνάφαλον*, *gnaphalon*, a lock of wool. Members of both genera are known in English by such names as *Cudweed*, *Chafeweed*, and the East Anglian *Owl's Crown*, and all these names refer alike to the dense covering of soft woolly hairs that characterises the group, or to a use to which it was put for healing chafed parts of the skin.



THE COMMON CUDWEED—continued.

The Tribe *Inuleæ* have scattered leaves and may or may not exhibit ligulate ray-florets. If present, these are yellow ; but in the Cudweeds all the florets are alike and tubular. They have two linear, smooth, stigmatic arms to the style, each surmounted by a cone bearing hairs to expel the pollen from the tube of anthers, as in the *Astereæ* ; and their fruits are surmounted by a pappus, which in the Cudweeds is silky. The chief difference between the genera *Gnaphalium* and *Filago* is in the common receptacle, which in the former is flat and free from scales, whilst in the latter it is conical and bears a few scales near its margin. This practically means that in this latter genus the imbricate-lanceolate bracts of the involucre, which are longer than the florets, are so continued as to be intermixed with the outer florets. Several rows of these slender outer florets are female, only a few towards the centre being thicker and perfect.

There are about a dozen species of *Filago*, all of which are hoary annuals, natives of the Northern Hemisphere, mostly small. Of these, four or five are British, inhabiting dry gravelly places.

The Common Cudweed (*Filago germanica* Linné) is a singular little plant, not easily overlooked. Its branching tap-root gives it a good hold in the loose soil ; so that its stem rises erect to a height of from four to twelve inches, branching freely in a unilaterally cymose manner, the branches springing from below the flower-heads. Stem and branches are thickly set with ascending linear-lanceolate leaves ; and both stem and leaves are densely cottony so as to appear pale grey. The florets are in small heads which are collected in globular clusters of from twenty to forty, terminating the stem and its successive branches. The arrangement of the branches gave the plant the name of *Herba impia*.

Pliny says of it :—

“The plant called *impia* is white, resembling rosemary in appearance. It is clothed with leaves like a thyrus, and is terminated by a head, from which a number of small branches protrude, terminated, all of them, in a similar manner. It is this peculiar conformation that has procured for it the name of *impia*, from the progeny thus surmounting the parent.”

The same notion has given rise, it is stated, to the English name of *Son-before-the-Father* ; but Petiver, looking upon this branching, as others have done, as comparable to such cases of proliferation as the Hen-and-chicken Daisy, called it by the pretty name of *Childing Cudweed*.

When they first come out, in July, the obscurely five-sided heads are yellow, but they fade to a dark brown.

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CCLXXXIV.—ELECAMPANE.

Inula Helenium Linné.

THE presence of yellow ligulate ray-florets gives the genera *Inula* and *Pulicaria*, which are closely related to one another, a very different appearance from their near allies the Cudweeds. With the Cudweeds they agree in scattered leaves ; in a character we have not hitherto specified, the presence of two bristle-like processes at the base of the anthers ; and in the presence of a pappus in the fruit ; whilst the style is similar to those both of the Cudweeds and of the *Astereæ*. These two genera, however, agree with one another, but differ from the Cudweeds in the roughness of the hairs of the pappus. It is in this organ also that we have the main distinction between *Inula* and *Pulicaria*, the pappus-hairs in the former being in a single whorl, whilst those of the latter are in two rows, of which the outer is shorter.

Inula is a genus of some ninety species, natives chiefly of Temperate and Sub-tropical Asia, twenty-four occurring in Europe and a few extending into northern Africa. They are mostly erect, perennial, and rather stiff herbaceous plants, their leaves taking an upward direction and their yellow-rayed flower-heads either solitary or in clusters which may or may not be flat-topped. Several rows of green more or less leafy imbricate bracts form a cup-shaped involucre ; but the common receptacle is flat and is destitute of scales. The ligulate ray-florets form a single row and may be female or neuter, while the tubular ones of the disk are perfect.

That the Elecampane (*Inula Helenium* Linné) is the type of the genus may be gathered from the fact that both its generic and specific names seem to have the same origin. The decidedly stately plant, especially when Sunflowers were not known and could not, therefore, be compared with it, was the 'Ελένιον, *Helenion*, of Dioscorides, considered sufficiently beautiful to have sprung from the tears of the supremely lovely daughter of Zeus and Leda, the wife of Menelaus, and the cause of the Trojan war.

The Classical Latin *Inula*, a name used by Horace, is probably merely a corruption of *Helenium*, and was itself corrupted into *Enula*, to which *campana* is said by St. Isidore to have been added because the plant grew wild in Campania. Turner, in 1538, writes :—

“Helenium, latinis est inula, officinis enula campana vulgo Allicampane.”
“*Helenium* is for the Latins *inula*, in the apothecaries' shops *enula campana*, popularly *Allicampane*.”

The plant has some aromatic and tonic properties in its rhizome. Though mostly filled with *inulin*, the soluble carbo-hydrate which in most *Compositæ* takes the place of starch as a food-reserve, this contains a crystallisable substance resembling creosote and known as *helenin*, having a camphor-like smell. With a reputation as an expectorant and tonic, which is maintained in French veterinary medicine, in which it is known as “Wild Cinchona,” the plant seems to have been considerably



ELECAMPANE—continued.

cultivated from early times. With a massive rhizome and strong growth it is capable of holding its own against drought and other vegetation, and has thus been long established in a quasi-wild condition, though some botanists doubt if it is ever truly so to the west of Russia. Thus we get such contradictory opinions as the following which refer to its occurrence in the Isle of Wight. In the "Philosophical Transactions" for 1770 it is recorded from "waste places about Freshwater and elsewhere." Dr. Bromfield, about the middle of the last century, records it as "truly wild in moist meadows, pastures, woods, about borders of fields by stream-sides, and amongst bushes in very many parts of the Isle of Wight"; whilst Hewett Watson in 1873 writes "in the Isle of Wight it seemed to be obviously an introduced plant." The plant is, at all events, sufficiently conspicuous to have acquired two local names in the Island—*Velvet Dock*, referring to the soft hoary down on the under surface of its large leaves, and *Wild Sunflower*.

If, however, Dr. Prior is right, this plant, in names and repute, has been the subject of a most marvellous etymological blunder. We have an Old English name for it, *Hors-elene*. In a Latin-French-English vocabulary of the thirteenth century it appears as *Enula*, *alne*, *horselne*; and in the "Grete Herball" of 1526 as *Horshel*. Dr. Prior explains this by supposing *Inula* to have been mistaken for *hinnula*, a colt, and *Helenium* for something to do with heels or healing, and the plant to have thus come to be thought a remedy for scabs or sore heels in horses.

Of our four British species of the genus, this is certainly the handsomest. It stands three to five feet high, with long-stalked radical leaves a foot or more in length, and the cauline ones sessile and amplexicaul, bright green above and grey below. The solitary flower-heads at the summits of the downy branches are three inches across and of a fine golden-yellow, though the narrow linear ray-florets cannot compare for effect with the broad flowers of *Helianthus* or *Rudbeckia*. These ligulate florets are unequally three-toothed at their extremities. The fruits are four-angled and smooth and are surmounted by a pale reddish pappus.

The rhizome is still used in a candied state for coughs and a liquid preparation known as *Vin d'Aulnée* is used in France for the same purpose.

This and several hardy exotic species are useful plants for the wild garden, growing well in ordinary garden soil, especially with an autumn or winter top-dressing of manure. They can be readily propagated by cuttings of the rhizomes.

CCLXXXV.—THE COMMON FLEABANE.

Pulicaria dysenterica S. F. Gray.

THE Family *Compositæ* is, as we have seen, not only a very large one but also very well defined or isolated. Its nearest allies are those *Campanulaceæ*, *Dipsacæ*, and *Valerianaceæ* in which, though the flowers may be small and be massed together in capitulate inflorescences, the stamens are free and there are generally more than one chamber to the ovary. It is a rule with all such large, well-defined Families that the characters which separate their genera and even their Tribes are comparatively slight and inconspicuous. Linné's genera, based very largely on few, or even single, characters are often very extensive, and have been satisfactorily subdivided by later workers into more manageable and perfectly natural groups of species, united, in most cases, by a collection of various, if less obvious, structural features. Thus the genus *Inula*, besides belonging to his large "Order" *Polygamia superflua*, having no stamens to the ray-florets but perfect disk-florets, was separated—together with more than a dozen other genera represented in our British flora—into a group of genera in which there are ligulate ray-florets; whilst its own characters, besides the imbricate involucre bracts and naked common receptacle which it shares with many other genera, are mainly the very numerous linear ray-florets and the presence of two bristle-like processes, as long as the filament, at the base of each anther. With this distinctive floral character was associated an erect stem; simple and usually more or less downy leaves; large yellow flower-heads; and bitter, aromatic, and often mucilaginous properties. The Linnæan genus *Inula* thus included those species which we now, following the "De Fructibus Plantarum" of Joseph Gaertner (1788–92), separate under the genus *Pulicaria*.

This genus comprises some thirty species, which, like the ninety which remain in the original genus *Inula*, are natives of the Temperate and Sub-tropical regions of the Old World. Though they have generally a looser involucre with fewer rows of bracts than *Inula*, the main distinctive character is the biseriate or two-rowed pappus, the outer row consisting of a series of more or less united, short, membranous scales; and the inner of a few rough, bristle-like hairs, unequal in length, and of a dirty white colour.

That these plants had an ancient reputation as being obnoxious to fleas, either merely from their pungent smell, or from the abundance of their fine-grained dry pollen which may clog the spiracles of the insect, is evidenced by Cordus's name for them, *Psyllium*, from the Greek ψύλλα, *psulla*, a flea, which had been applied by Dioscorides to a very different plant; and by Turner's coinage of the name *Fleabane*. They had been included by Dioscorides under the name Κόνυζα, *Konuzā*, which Linné retained as *Conyza* for a related genus; and Turner, in 1548, writes:—

"Coniza maye be called in englishe Flebayne."



THE COMMON FLEABANE—continued.

Linné's specific name *pulicaria*, from the Latin *pulex*, a flea, was given to our smaller annual species, now known as *Pulicaria vulgaris* Gaertner ; and Gaertner adopted it as a generic name.

To Matthiolum, Lobel, Gerard, and Bauhin the species here represented was known as *Conyza media* ; and Gerard, comparing its soft woolly leaves to those of the Mullein, or as he sometimes writes it Mullet, probably from the Latin *mollis*, soft, through the French *mollet*, calls it *Fleabane Mullet*.

London is to-day one of the most perfectly drained and, therefore, driest areas of soil of similar extent in the world, and we do not, therefore, expect to find this plant, which Gerard describes as growing "in everie waterie ditch," where it is recorded by Johnson in 1633, "in S. James his Parke," and "Tuthill Fields." It was probably because it was a waterside plant that, like *Osmunda regalis* Linné, it was known as *Herb Christopher*. Johnson says :—

"In Cheapside the herbe-women call it Herbe Christopher, and sell it to Empericks, who with it (as they say) make medicines for the eyes, but against what affect of them, or with what successe, I know not."

The plant is, like the *Inulas*, bitter, aromatic, and mucilaginous ; and presumably to these properties, and not to any important specific contents, it owed the reputation which gained it its present specific name. Linné, who called it *Inula dysenterica*, records, on the authority of that remarkable soldier of fortune Marshal Keith, that it cured the Russian army in an epidemic of dysentery.

The first botanist to give the plant its correct modern name, with Gaertner's genus and Linné's earliest specific name, was Samuel Frederick Gray (1780-1836), whose "Natural Arrangement of British Plants" (1821) was the first British Flora arranged according to the modern Natural System, and has never, perhaps, received its fair meed of recognition. It was said to be largely the work of the son of its nominal author, John Edward Gray (1800-75), afterwards better known as a zoologist.

The Fleabane is a perennial and spreads over wide spaces of wet ground, especially on stiff retentive soil, by means of the suckers given off by its creeping rhizome. The woolly or cottony aerial stems rise erect for twelve or eighteen inches, branching above, and thickly set with leaves. The leaves are scattered, slightly ascending, sessile, amplexicaul, cordate-oblong, acute, irregularly waved, and cottony on their under surfaces ; and the flat flower-heads, which are about an inch across, are more or less corymbosely arranged, making a fine display of gold over the broad patches covered by the plant. The heads contain about a hundred of the narrow spreading ray-florets, and about six times as many of the deeper orange disk ones. The bracts of the involucre are numerous, bristle-like, and densely woolly. The fruits are angular and silky.

CCLXXXVI.—THE BUR-MARIGOLDS.

Bidens cernua Linné and *B. tripartita* Linné.

IN spite of its cosmopolitan distribution, the high grade of specialisation in the *Compositæ*, more especially in flower and fruit, make us regard the Family as probably of quite recent geological origin. Though it is remarkable that we have among them a great predominance of the primitive yellows and whites in the colours of their corollas—to the extent that these colours are given as characteristics of many Tribes of the Family—we do not forget that others among them have attained not only to the orange of *Gazania*, the rosy tints of *Achillea*, and the varied purples of *Aster*, but also to the deep reds of Thistles, the pure blues of Cornflowers, and the polychrome variations of Zinnias and Cinerarias. It is, however, within the limits of a recent, dominant Family such as this, adapting its members, even within the limits of a single genus, to almost every conceivable situation, that we may expect to find those polymorphic groups that defy the efforts of the systematist, those “critical” groups in which mere variability—apart altogether from hybridism—render it wellnigh impossible to separate the species, so that we conclude that we are faced with the phenomenon of the raw material of an as yet incompletely operative natural selection, with species as yet “in the making.” We see the same thing in other Families, in dominant groups which may owe their dominance to the simplicity of their surroundings, or which have attained a simplified structure as the result of secondary, or degenerative, modification—including, however, in most cases, great reproductive powers, in Water Crowfoots or *Potamogeton*, or in Willows. But some of the most striking instances of such polymorphism are to be seen among the most highly specialised groups, such as the Mints among the *Labiatae* and the Hawkweeds (*Hieracium*) among *Compositæ*. Such groups are, however, extremely difficult to study experimentally or analytically, if only from the difficulty of identifying and isolating the forms upon which repeated control experiments are to be performed. It is, therefore, perhaps, more instructive to follow out an investigation in some less polymorphic group, in which a few generally defined “species” can be well discriminated before being submitted to experiment. This has been done in the case of our two so-called species of Bur-marigold.

Bidens belongs to the Tribe *Heliantheæ*, which includes such well-known American groups of plants, popular in our gardens, as the Sunflowers (*Helianthus*, *Rudbeckia*, etc.), Dahlias, and Zinnias. They mostly have opposite leaves; bracts without membranous margins; a common receptacle furnished with scale-like bracteoles; yellow, ligulate, female or neuter ray-florets; perfect, polysymmetric disk ones; anthers without processes; and fruit in which the pappus does not take the form of hairs. In this Tribe, *Bidens* is the only genus truly indigenous in Europe, in which continent some four, out of a total of about ninety, species occur; and, of these, *B. cernua* Linné and *B. tripartita* Linné, the two species represented on our Plate, are the only two British forms.



THE BUR-MARIGOLDS—continued.

The species of the genus *Bidens* are mostly annual, glabrous plants, with their leaves mostly opposite ; their flower-heads nearly solitary, yellow, and, as a rule, without ray-florets ; but with an outer row of spreading leafy bracts. The common receptacle is flat and bears a scale-like bracteole to each floret. The linear arms of the styles are tipped with a papillose cone of expelling hairs ; and the genus took its name *Bidens*, translated by Withering as *Double-tooth*, from the pappus, in which the angles of the compressed fruit are prolonged upwards into two, three, four, or five stiff barbed bristles. These barbed bristles, which form a pretty object under the microscope with polarised light, aid in the dispersal of the fruits by becoming entangled in the hair of passing animals, whence the name *Bur-marigold*.

Having been classed by Matthiolum, Lobel, and other early writers under *Eupatorium* (Hemp Agrimony), these plants were named by Gerard *Water Agrimony* ; but they cannot be said to have received the popular recognition of a generally current vernacular name.

Of the two British forms, *B. cernua* Linné, which appears on the left side of our Plate, grows a foot or two in height ; has a stem often tinged with red or brown ; simple, lanceolate, serrate, sessile leaves ; and, as its specific name *cernua* signifies, drooping heads. The other species, *B. tripartita* Linné, is rather more slender, with stalked, tripartite leaves and smaller, nearly erect heads. *B. cernua* has usually three or four pappus-bristles ; *B. tripartita*, two or three.

Several slight variations, or possible hybrids, since the two species may occur side by side, have been described, with ray-florets, exceptionally broad flower-heads, or with erect heads and undivided leaves. About twenty years ago, however, Dr. H. B. Guppy carried out some interesting greenhouse experiments on these plants, the results of which have only recently been published. He points out that *B. cernua* prefers the wet borders of ponds and ditches, and *B. tripartita*, the river-bank, this latter growing more frequently out of the water than does *B. cernua* ; but that occasionally in the midst of a patch of one species will be seen a single individual of the other. In his experiments seedlings from both forms were grown for three or four generations in soil kept as dry as possible, with the results that the plants were reduced to a third of their average height ; that their stems became slender and their fruits less than half their usual length ; and that seedlings of both species developed tripartite leaves in their second, third, fourth, and fifth pairs. These experiments, therefore, suggest the query whether, in spite of the apparently well-marked specific differentia between these two forms, *B. cernua* may not be a semi-aquatic modification of *B. tripartita*.

CCLXXXVII.

Galinsoga parviflora Cavanilles.

IT is, perhaps, indicative of the dominant character of the Family *Compositæ* that out of 924 aliens enumerated in Mr. S. T. Dunn's "Alien Flora of Britain," 163, or between a sixth and a fifth of the whole number, belong to this Family. This is nearly twice as many as the alien *Leguminosæ*, the next most numerous Family, and is clearly more than the proportion to be expected merely from the total number of *Compositæ*, which is, as we have seen, only about a tenth of the total number of Flowering Plants.

In discussing *Mimulus Langsdorffii* Donn we have already stated the plausible view that any plant has the right to be considered a native that can hold its own, on the plea that every species in our flora must at some time or another have been introduced, unless it may have actually originated *de novo* in our area. There is, however, considerable scientific interest in separating those species that have apparently been throughout human history in these islands from those subsequently introduced; and in tracing, as far as we can, the date and means by which these aliens have been introduced and have succeeded in establishing themselves. It is, therefore, much to be wished that notice should be taken of aliens, their source of origin, their date of arrival, and their comparative success. Such records may throw useful light on various questions of ecology.

The genus *Galinsoga* was founded by Messrs. Ruiz and Pavon in their "Flora Peruviana et Chilensis" (1798-1802), in honour of a Spanish botanist, Don M. de Galinsoga. It comprises five species, ranging originally from Mexico to Argentina. They are annual herbs, branching, as is well shown on our Plate, trichotomously, and with opposite, three-veined, serrate leaves. They have small flower-heads, with a single circle of four or five broad involucral bracts with fringed membranous margins; a conical common receptacle with a scale-like bracteole to every floret; a single row of short, broad, trifid, ligulate, female ray-florets; and a small number of tubular, perfect, yellow disk-florets. The anthers have short tails; and the fruit is prismatic, hispid, and crowned with a pappus consisting of a row of oblong ciliate scales. Of the five species, *G. parviflora* Cavanilles is a native of rough, marshy, and stony ground in both Central and South America, and was first noticed in Europe at the beginning of the nineteenth century. It is now established in Portugal, Germany, and Denmark, as well as in England, and is locally abundant. As its fruits are occasionally found among corn-siftings, Mr. Dunn suggests that it may have first come to Europe with American wheat. De Candolle says that it was first noticed in a garden in Germany in 1800, had spread about Memel by 1807, in Lithuania and Courland by 1839, and soon after in Saxony and the Rhine valley, always in fields. In England, however, it is chiefly found in Surrey and Middlesex, and seems to owe its origin to Kew Gardens. It luxuriates in the rich market



garden soil from Mortlake to Petersham ; but occurs also by the roadside and even among paving-stones and on dust-heaps about Richmond. Mr. Britten recorded it at Parson's Green, in 1862, and the Rev. W. W. Newbould, from the market gardens of the Lower Brent valley, in the following year.

It is a slender plant, about a foot high, and more or less pubescent. Its leaves are opposite, stalked, ovate, serrate, ciliate, and from one to two inches long. The short white ray-florets, only numbering from four to six surrounding the small group of yellow disk-florets, may well lead to the plants being at first glance mistaken for one of the *Caryophyllaceæ*—which have a similar branching—or some other Family. The peduncles have glandular hairs : the involucre is hemispherical, with unequal, ciliate bracts ; and the compressed black fruit is surmounted by a pappus of from ten to fifteen narrow scales. The flowers are probably pollinated by flies or by their own pollen ; and, as the plant produces a profusion of flower-heads from July till it is killed by the frosts of October, its seed-production is great enough to explain in part its well-established position. We have seen the furrows of potato-fields covered with it, soon after the potatoes have been dug, and it seems, in the area which it has as yet occupied, to have replaced the Common Groundsel.

So recently has it been acquired that we have hesitated to put a “ popular ” name at the head of this description ; but the name itself, and the popular explanation which goes with it, is not more grotesquely phonetic than others which have now obtained the sanction of long usage. The scientific name, the only one the botanist could give, was unintelligible and so became *Gallant Soldier* ; and this intelligible name, requiring some justification, has found it in a comparison of the little flower-heads, *minus* their ray-florets, to the little tufted horsehair plume in front of a military busby. This popular name and its explanation—both the genuine spontaneous product of the last few years, during which only has the plant become familiar—are examples of the way in which not a few names and their explanations have come into existence in former times.

CCLXXXVIII.—THE OX-EYE DAISY.

Chrysanthemum Leucanthemum Linné.

THE Tribe *Anthemideæ* mostly have scattered leaves ; a membranous tip and edges to the bracts of the involucre ; no tails to the anthers ; and no pappus to their fruits. They vary as to the form of the common receptacle, the presence or absence of bracteolar scales, the number of rows of involucre bracts, and the form of the outer florets, which may be ligulate or tubular. The Tribe includes the Yarrows or Milfoils (*Achillea*), the Chamomiles (*Anthemis* and *Matricaria*), *Chrysanthemum*, Tansies (*Tanacetum*), and Wormwoods (*Artemisia*)—an interesting and varied assemblage, including several of the mild popular medicines of former times. The last-named genus is, like the Burnets (*Poterium*) and the Plantains (*Plantago*), an example of a whole genus belonging to a Family highly specialised for insect-pollination having reverted to wind-pollination.

The genus *Chrysanthemum* is now held to include Haller's genus *Pyrethrum*, to which the Common Feverfew (*Chrysanthemum Parthenium* Persoon) belongs, and, though there have been great differences of opinion as to its generic limits, may be said to be a widely-spreading group, comprising about a hundred species. Some of them are shrubby and may tend to form wood ; but some, like the Yellow Corn-marigold (*C. segetum* Linné), almost certainly the original plant to bear the name, are annuals. They may have radical leaves and those on the stem are scattered and simple, though often much cut. Their flower-heads may be solitary or in corymbose clusters, and have a campanulate involucre of imbricate bracts with membranous margins ; a flat or convex, naked, common receptacle ; a single row of ligulate, female ray-florets, which in wild forms may be white or yellow ; and perfect disk-florets. The fruits of the ray and disk florets differ, the former being smooth and cylindric or ribbed, but not winged ; the latter, compressed, slightly angular, or winged.

Several species are of some economic importance. The Feverfew (*C. Parthenium* Persoon) was, as its name—a corruption of *Febrifuge*—indicates, a popular remedy against slight fevers ; but is now chiefly known in the so-called “double” forms as an ornamental plant, some of them having deeply-cut Parsley-like foliage, and others leaves of a golden hue. The dried and powdered flowers of *C. cinerariifolium* Visiani are exported from Ragusa in considerable quantities under the name of Dalmatian insect-powder ; and those of the Caucasian *C. roseum* Adam are similarly employed under the name of Persian powder. This latter species is also largely grown for ornament under the name *Pyrethrum*, with white, yellow, rose-coloured, or crimson flowers, of which there are scores of named varieties. *C. frutescens* Linné, a native of the Canary Islands, with either white or yellow ray-florets, is imported in immense quantities as cut flowers under its French name *Marguerite* ; and mention must be made of the handsome Pyrenean *C. maximum* Ramond, a strong-growing plant resembling our Ox-eye Daisy,



THE OX-EYE DAISY—continued.

but with larger flower-heads. By far the most important of the cultivated species, however, are the countless forms of *C. indicum* Linné, of which *C. sinense* Sabine is, perhaps, only a geographical form. Though grown for centuries in China and Japan, their development in Europe is the work of little more than a century; but now so many are the varieties in the various groups, known as Incurved, Recurved, Quilled, Pompon, and Japanese, that gardeners speak of them under the familiar abbreviation of “'mums.” It has, however, been cruelly said of the huge mop-headed blooms exhibited in November shows that “they are highly fed with artificial manurial foods (like prize pigs and poultry) and the flowers are carefully twisted and curled—‘dressed’ it is called—with tweezers,” and they are admirably reproduced in coloured paper.

The name *Chrysanthemum*, or rather *Χρυσάνθεμον*, *Chrusanthemon*, from χρυσός, *chrusos*, gold, and ἄνθεμον, *anthemon*, a flower, was given by Dioscorides, no doubt, to the beautiful but troublesome weed long known as *C. segetum*, the Corn-marigold; whilst the white-rayed species was named, also by Dioscorides, Λευκάνθεμον, *Leukanthemon*, from λευκός, *leukos*, white, the name preserved by Linnæus as specific. So too this beautiful meadow plant has to some extent usurped the obvious popular name *Gowan* from its congener, though it would be difficult to improve upon Gerard’s rendering of its name as *White Gold*. In some parts of Scotland all yellow-flowered *Composite* are called *Gowans*, and the name is even extended to yellow flowers not of that Family, such as *Trollius*. The name is spelt in an immense variety of ways, including *Gowlan*, *Gules*, and *Gild*; but it is obviously simply the Old English “gold” or a still more primitive “geol,” meaning yellow. *Midsummer Daisy* (from its season of flowering), *Great Daisy* (used by Lobel), *Big*, *Bull*, *Dog*, or *Horse*, *Daisy*, all merely implying its larger and coarser growth than that of *Bellis perennis*, are a few of the names it bears. Another old Greek name Βούφθαλμον, *Bouphthalmon*, from βούς, *bous*, ox, and ὄφθαλμος, *ophthalmos*, eye, gives us the name *Ox-eye*, which is used also in Italy as *Occhio di bue*; whilst the much used *Moon-daisy*, *Moon-penny*, or simply *Moon* probably refer to old representations of the full moon distinguished from the sun by its silver rays.

C. Leucanthemum is a perennial and may be either glabrous or slightly hairy. It grows to a height of one or two feet and is seldom branched above ground, the stem being furrowed with reddish ribs between the furrows. Its leaves are pinnately cut, the lower ones stalked and spatulate, the upper narrow and amplexicaul. The flower-heads may be two inches in diameter, and the narrow bracts of the involucre with their dark purplish margins are very characteristic. The ligulate corolla is notched at its apex. All the fruits are terete and black but ribbed with white, those produced by the ray-florets, however, being distinguished by a slight ring-like rudiment of a pappus.

CCLXXXIX.—THE COMMON TANSY.

Tanacetum vulgare Linné.

THERE is not, at first sight, much likeness between the Tansy, with its apparently rayless heads of tubular yellow florets, and the genus *Chrysanthemum*, in which the ligulate ray is in general so very prominent. When, however, we come to examine the structure of the inflorescence with care, we find that the differences between the two genera are very slight, so that Hoffmann in Engler and Prantl's "Natürliche Pflanzenfamilien" actually sinks *Tanacetum* under *Chrysanthemum*. We refrain from following him in this, since we might be compelled by equally strong arguments to throw in also the large genus *Artemisia*, which does but differ from *Tanacetum* in having smaller flower-heads with consequently a narrower common receptacle and fewer bracts, and in being wind-pollinated.

Tanacetum includes some fifty species, natives of the Temperate regions of the Northern Hemisphere, some seven or eight of which belong to Europe, but only one has any claim to rank as a British plant. Because it is still commonly grown in gardens and is often found in "such artificial surroundings as roadsides, hedges, and field-borders," some botanists have considered our Common Tansy (*Tanacetum vulgare* Linné) as "probably naturalised only"; but Mr. Dunn, who is certainly not over prone to admit any plant to be a native, says that it is so by "river-banks and rough bushy hillsides in England." Nor when we see this handsome plant exhibiting its feathery foliage of brightest green and broad corymbose clusters of golden flower-heads along the banks of the Mole, or many another English stream, is it easy to think of it as anything but indigenous. It is, however, a very sturdy perennial, well capable not only of holding its own but also of extending its area; and it is unquestionably a plant that has been long cultivated in this country, so that its indigenous character may be more questionable than it appears. At the same time, its continental distribution accords well with its being indigenous, since, like some of its congeners, it belongs essentially to the northern or Siberian and Central European type of distribution, not extending into Turkey, Greece, Portugal, or the islands of the Mediterranean.

All the species of the genus are scented, herbaceous, or somewhat shrubby plants, with scattered, cut leaves; sub-globose "discoid" yellow flower-heads; involucre bracts in several rows and with membranous margins; a convex, naked common receptacle; and angular fruits, crowned with a large, lobed, membranous disk. Though not obviously differing from the disk-florets, there is usually a single row of ray-florets, tubular below, and female, but with a slight spreading three- or four-cleft limb.

The name, though later *Tanaisie* and now *Tanacée*, appears in Old French as *Athanasie* and in Mediæval Latin as *Athanasia*, which is the Greek ἀθανασία, *athanasia*, immortality; but the reason for this name appears somewhat doubtful. Dodoens



THE COMMON TANSY—continued.

says that it is so called because the flowers do not wither quickly ; but this is hardly a fact. Dr. Prior gives us the ingenious explanation that the name arose from the misunderstanding of a passage in Lucian's "Dialogues of the Gods," where Zeus, speaking of Ganymede, says to Hermes, "Take him away, and when he has drunk of immortality (*τῆς ἀθανασίας*, *tes athanasias*), bring him back as our cup-bearer," *athanasia* being taken to be some special plant. Hyacinth Ambrosinus of Bologna (1605-72), in his "Phytologia" (1666), says that the plant is called *Athanasia* because its juice or oleaginous extract is used in embalming corpses. In England the plant has certainly been known as Tansy from the thirteenth century ; and its bitter, tonic, febrifuge, and vermifuge properties caused it to be a valued ingredient in various dishes. A fourteenth-century manuscript in the British Museum gives the following recipe :—

"Breke egges in a bassyn and swynge hem sone
Do powdir of pepir therto anone.
Then grynde tansay, the juice owtewrynge
To blynde with the egges without lesynge.
In pan or skelet thou shalt it frye
In butter wele skymm and wyturly.
Or, whyte grese thou may take therto.
Geder hit on a cake, then have thou do
With platerre of tre and frye hit browne."

Such savoury omelettes seem to have been specially eaten at Easter, the bitter herbs of the Passover being mixed with eggs which were prohibited during Lent : as an old rhyme has it :—

"On Easter Sunday be the Pudding seen,
To which the Tansy lends her sober green."

Isaak Walton says of minnows :—

"In the spring they make of them excellent minnow-tansies . . . being fried with yolks of eggs, the flowers of cowslips, and of primroses, and a little tansy : thus used, they make a dainty dish of meat."

But, though considered excellent for this, that, and the other ailment, Tansy puddings, Tansy cakes, and Tansy candy are now forgotten, even in New England, where the plant was introduced for the sake of them.

Our species, *T. vulgare* Linné, has a creeping rhizome ; an angular, furrowed stem, two to three feet high, but unbranched ; and deeply bipinnatifid leaves, with serrate margins. Its scent, though pungent, is not unpleasant. A variety, known as *crispum*, with more or less waved and crested leaf-segments, was first described as English by Lobel, under the name *Tanacetum cristatum anglicum speciosum*. It was formerly valued as being milder in flavour or more wholesome than the common form ; but is now used, for its foliage only, as a plant for the rockery. It is readily multiplied by dividing the rhizome.

CCXC.—THE COMMON RAGWORT.

Senecio Jacobæa Linné.

THE Tribe *Senecioneæ* have scattered leaves ; a naked common receptacle ; the flowers all of one colour, generally yellow ; the anthers without tails ; and the fruit surmounted by a hairy and generally very soft pappus. Besides the great genus *Senecio*, from which it takes its name, the Tribe includes the Butterburs (*Petasites*), with huge leaves and racemose clusters of heads of lilac florets, and the Coltsfoot (*Tussilago Farfara* Linné), with a solitary head of yellow florets developed before the broad leaves.

Senecio, with over 1,250 species, is by far the largest genus among Flowering Plants. It forms, it will be seen, more than a tenth of the species of the Family *Compositæ*, or more than one per cent. of the species of all known Flowering Plants. In distribution it is as cosmopolitan as the Family, though more especially characteristic of Temperate and Cold climates. In habit also its species exhibit a very wide range of variation. They may be annual, biennial, or perennial ; herbs, bushes, shrubs, or even trees ; smooth or woolly. Many species are xerophytic, with fleshy stems, fleshy leaves, or very hairy leaves, or leaves with inrolled margins : others are ivy-like climbers. Some, like our Common Groundsel (*Senecio vulgaris* Linné) have no ray-florets and are self-pollinating ; while others, like the Ragwort (*S. Jacobæa* Linné) have a conspicuous ray, and their flower-heads massed corymbosely, and are visited by a variety of insects.

As might be expected from their varied habitats, they vary much in the characters of their scattered leaves and in the size and grouping of their generally yellow flower-heads ; but they agree generally in having only a single row of bracts in the involucre, without membranous margins, but withering black at their tips. Their ray-florets, if present, form one row of ligulate, female florets ; while those of the disk are tubular and perfect ; and the pappus is composed of slender soft hairs of equal length. This last-mentioned character is the origin of the generic name *Senecio*, from *senex*, an old man. It dates from Pliny, and is practically a Latin rendering of the Greek ἡριγέρων, *erigeron*, from ἥρι, *eri*, early, and γέρων, *geron*, an old man, a name now used for another group which includes some of the Fleabanes.

It is somewhat difficult to gauge what we mean by height of organisation and by success among plants. The two certainly do not necessarily go together. Some of the most elaborately constructed Orchids have secured but a very limited area of distribution, as in the case of the species of *Disa* in South Africa ; whilst on the other hand comparatively lowly-organised plants, such as *Pinus sylvestris*, may be so well adapted to surroundings unfavourable to many other types of constitution as to have covered very extensive regions. In the *Compositæ*, however, we have the concurrence of several series of adaptations of great use in the struggle for existence. We have flowers reduced in size but massed in heads, protected by a common



THE COMMON RAGWORT—continued.

involucre, economising material in both calyx and corolla and enabling one insect-visitor to pollinate many flowers : we have the honey and pollen effectively protected from waste and from the depredations of unsuitable insect-visitors ; whilst pollination is not restricted to one class of insects, and, failing cross-pollination, self-pollination is possible ; and we have numerous small fruits effectively distributed by means of the pappus. When, with such adaptation, we find species of a genus such as *Senecio* spreading, within recent geological times, over the whole globe, some of them tending to become social and ready to occupy vacant ground, we must conclude that we have a remarkable example of high organisation achieving success in the struggle for existence.

The Common Ragwort (*S. Jacobæa* Linné) is not particular as to the chemistry of its soil : it is common alike on fixed sand-dunes, gravel, upland heaths, and chalk ; but it seems clear that it likes a sunny situation and good drainage. It will bear the greatest drought and heat which our climate ever produces. A perennial, with a rather fleshy rhizome, its aerial stems rise erect to a height of two to four feet, bearing doubly pinnatifid, sometimes lyrate, leaves. The plant is generally glabrous, but sometimes slightly cottony, and is fetid when bruised, so that cattle generally avoid it. It is to its cut leaves that it owes its most general name, *Ragwort*, though it has many others, such as *Stinking Weed* and *St. James's Wort*, the latter a translation of Fuchs's *Herba Sancti Jacobi*, with reference to its flowering about July 25th, though it is in fact generally much earlier. The corymbose branches bearing masses of golden flower-heads, each about an inch across, afford one of the grandest displays of colour in our fields and waste grounds, where this species often covers wide areas. The fruits of the ray-florets are glabrous and ribbed and lose their pappus, whilst those of the disk-florets are covered with short silky hairs.

Though not eaten by cattle, the foliage of the Ragwort is often entirely devoured by the caterpillars of the Cinnabar moth (*Euchelia Jacobææ*). These larvæ are banded with alternate rings of black and yellow, and, though the yellow is similar to that of the flower, they are very conspicuous as they swarm over the plant. This is usually explained by calling their colours "warning colours," which are supposed to advertise to birds the fact that they are inedible.

CCXCI.—THE MARSH RAGWORT.

Senecio aquaticus Hudson.

IN the sixth volume of De Candolle's "Prodromus," in 1837, only 596 species were described under the genus *Senecio*. Of these, 200 were South African ; 115 belonged to Europe, North Africa, and western Asia ; 103 to South America ; 55 to North America and Mexico ; 43 to the East Indies ; 35 to Australia and the Pacific ; 28 to Mauritius and Madagascar ; 10 to the Canary Islands ; and 5 to China and Japan. That we now have more than double that number of species in the genus is partly owing to its having been found necessary to incorporate in it several groups of species formerly treated as separate genera, such as *Cineraria*, *Cacalia*, *Kleinia*, and *Ligularia* ; but it is also largely due to new discoveries in many quarters of the globe. If the proportion of species in each geographical region remains in general the same, the fact that we now have no less than 110 species from China, some of which are fine acquisitions to our gardens, and more than 500 from America, has certainly altered the position of those countries in the above list.

We can count about a dozen species as representing the group in England, of which only eight occur in Ireland and seven in Scotland.

They can be well grouped in two divisions or sub-genera, which are, in fact, the original Linnæan genera *Senecio* and *Cineraria*. In the former of these, which is most largely represented among European and British species, there are generally a few minute imbricate scales at the base of the circle of bracts forming the involucre ; whilst in the latter, the old genus *Cineraria*, these are absent. Our most familiar British species belong to the former division, including the Common Ragwort (*Senecio Jacobæa* Linné), represented on the previous Plate ; the closely-allied Marsh Ragwort (*S. aquaticus* Hudson), represented on this Plate ; the Groundsel, an annual species, with no ray-florets ; and other annual species, in which the ray is small or missing, such as *S. sylvaticus* Linné and the rarer *S. viscosus* Linné.

The Marsh Ragwort, considered merely a variety of *Senecio Jacobæa* by Linnæus and others, was recognised as distinct and named by Hudson in the first edition of his "Flora Anglica" in 1762. It is altogether more slender and looser in its habit of growth, its inflorescence consisting of fewer, larger, and more loosely grouped flower-heads, with more elliptical ray-florets. The plant is a biennial and is seldom quite glabrous. The root-leaves are very variable, being sometimes nearly entire ; but one of the most distinctive characters is the freedom from hairs of the surface of all the fruits, only those of the ray-florets being slightly rough near their apex.

One of the most remarkable series of ecological facts is that which tells of the evolution of complex forms of parasitic fungal life *pari passu* with the development of new species of the Flowering Plants upon which they prey. We are in these cases faced, of course, with many specialised forms of a group of organisms vastly lower in organisation than any Flowering Plant. A parasitic fungus does not, as a



THE MARSH RAGWORT—continued.

rule, confine its attacks to one species of plant : it may attack allied species, or all the genera of a Family, or be even more general in its choice of a victim. The most remarkable cases of fungal parasitism are, however, unquestionably those in which the same species of fungus passes through different stages of its life on widely differing host-plants. We alluded to one instance of this *heteræcism*, as it is technically termed, in the case of the Barberry and the cereal grasses attacked by the various stages of the fungus *Puccinia graminis* Persoon. An equally striking case affects the species of *Senecio* and *Pinus*, the fungus being now known as *Coleosporium Senecionis* Persoon. The leaves of Ragwort (*S. Jacobæa*), Groundsel (*S. vulgaris*), and other allied species are attacked by this fungus, the spawn or *mycelium* spreading through the interior of the leaf and exhausting its food-supply. In July and August more especially the fungus gives rise to powdery masses of orange-coloured spores in vertical rows which burst through the under surface of the leaves of the *Senecio*. These *uredospores*, as they are called, are rough and probably serve to infect other plants of the same group. Later on, however, the same mycelium gives rise to a second kind of spore which is smooth ; and, as this probably marks the completion of the life-history of the fungus on the *Senecio*, it is called the *teleutospore*, or final spore of the *Coleosporium*. As fresh crops of Groundsel are springing up almost all the year round, it seems that these uredospores and teleutospores of the *Coleosporium* are also in the air in the neighbourhood of the *Senecios* at almost every season. In April and May the younger needles of the Scots Pine, the Weymouth Pine, the Austrian Pine, and others may be seen to turn yellow, and on examination this change of colour will be found to be due to minute orange blisters which burst into "cluster-cups" or *æcidia* filled with spores, which were originally called the *æcidiospores* of *Peridermium Pini*. In May and June similar blisters make their appearance on the bark of the young branches of the Pines, and it has been proved that these are produced by the same fungus as those on the needles. Though the spawn of the fungus may grow in the leaves for a year or two without completely killing them, in the branches it consumes the starch, causes a great exudation of resin, and the death of the young wood and ultimately of the entire branch or tree. The *æcidiospores* of the *Peridermium* falling on the leaves of the *Senecios* germinate, enter the leaves, and develop into the spawn known as *Coleosporium*. It is clear, therefore, that *Peridermium* is but one stage of *Coleosporium*, and it is probably the teleutospore of the latter which infects the needles and bark of the Pine. It is found that the careful removal of all species of *Senecio* from the neighbourhood of Pine forests arrests the disease ; and we cannot be surprised, therefore, if the continental forester, who cultivates vast areas of Pine timber, wages a war of extermination against the Groundsel and its kin.

CCXCII.—THE CARLINE THISTLE.

Carlina vulgaris Linné.

THE Tribe *Cynareæ*, the Thistles, Burdocks, Knapweeds, and a few related groups, form a well-marked natural division of the Family. They have scattered leaves, which are usually toothed with protective spines, indicating the xerophytic character general to the Tribe and serving to ward off browsing quadrupeds. The involucre is often globose and its bracts sometimes spinous ; and the common receptacle is usually bristly. The flowers are all tubular and perfect ; or there may be some female or neuter ones forming a ray, the florets of which, however, are not ligulate. The anthers are exserted and may be tailed ; and the style is thickened below its branching, usually with a ring of hairs in the same region.

The genus *Carlina* is a small one, comprising less than twenty species, distributed from Central Asia over Europe and North Africa, and occurring also in the south of that continent. They are stiff, spinous plants, with pinnatifid leaves and, as their most striking peculiarity, the outer bracts of the involucre leafy, spinously toothed, and spreading, while the inner are longer, narrower, membranous, or chaffy, shining and sometimes coloured, thus resembling those of the so-called Everlasting-flowers and performing the attractive functions of ray-florets. The common receptacle is flat but deeply pitted, the florets being imbedded in the pits, on the margins of which are bracteolar scales cleft into bristle-like bodies. The florets are all alike tubular and perfect, with a campanulate, five-toothed limb to the corolla ; a terminal appendage to each anther and two short deflexed plumose bristles at its base ; and the two arms of the style united into a pubescent cone. The fruits are round in section and are covered with long, silky, bifid hairs and surmounted by a pappus formed of one row of feathery hairs, united below in threes and fours and at their base into a ring.

Jacob Theodor of Berg-zabern, better known—under the Latinised form of the name taken from his Alsatian birthplace—as Tabernæmontanus, who died in 1590, tells us that the name *Carlina*, used by Dodoens, is an abbreviated form of *Carolina*, and commemorates the first Frankish Emperor, Karl the Great, commonly miscalled Charlemagne. Tabernæmontanus relates that a horrible pestilence broke out in his army, and carried off many thousand men, which greatly troubled the pious emperor. Wherefore he prayed earnestly to God, and in his sleep there appeared to him an angel, who shot an arrow from a cross-bow, telling him to mark the plant upon which it fell, for that with that plant he might cure his army of the pestilence. And so it really happened, the plant in question being *Carlina acaulis* Linné, the pretty Weather-Thistle of the Alps and Central Europe. It has a pungent, bitter, and tonic root ; but Sir J. E. Smith somewhat caustically remarks :—

“The large white everlasting flower is perhaps most useful, when nailed upon cottage doors, in Germany, France, or Italy, by way of a hygrometer, as it closes before rain.”



THE CARLINE THISTLE—continued.

Several of the species, and especially *C. gummifera* Lessing, contain an acrid resin in which the medicinal virtue of the plants is supposed to reside ; but the roots of others are said to be edible. Linné tells the story of the army of Charles V cured of the plague, and places the scene of the cure in Barbary, oblivious apparently of the mention of it by Dodoens and Tabernæmontanus, which would hardly fit in with the date of the contemporary of Henry VIII. Our only British species, *C. vulgaris* Linné, is a biennial with a long, slightly branched tap-root and a stout, erect, round stem rising from six to twelve, or even eighteen, inches high and sometimes branched. It is often tinged with red and has a hoary or cottony surface. There is a rosette of radical leaves which are lanceolate and spinous and cottony on their under surfaces which spread out upon the ground. The numerous cauline leaves are shorter and amplexicaul, and are sometimes also cottony beneath. The flower-heads are an inch or more in diameter, their outer bracts spreading, bipinnatifid, spinous, and cottony, the next series reddish and the innermost straw-coloured, narrow, rigid, acute, and fringed along the lower half of their margins. The florets are a dull red with yellow anthers and stigmas and are succeeded by brown fruits, the stiff yellow bracteolar bristles being longer than the soft pappus. The glossy straw-coloured inner bracts, spreading horizontally in fine weather, are more conspicuous than the flowers themselves. When the air is moist, or at night, they rise through many degrees, arching as a penthouse over the florets. They are also very durable, retaining their form long after the flowers are dead and when the spinous leaves have become skeletons. In the country the plant is sometimes gathered and hung up as a weather-glass like its continental congener.

When first this species was mentioned as a British plant, Gerard wrote of it as growing

“in untoiled and desart places and oftentimes upon hils.”

This is an apt summary of its habitats. It is not particular as to the composition of the soil, occurring both in fixed and mobile sand-dunes, on inland heaths, and on chalk and limestone hills. It seems to like the neighbourhood of the sea, upland positions, and ground that has been long undisturbed. It may, for example, generally be seen on the South Downs in old road-tracks or in spots where the turf has long ago been removed. Its deep roots enable it to flourish in very dry places and it clearly demands thorough drainage.

CCXCIII.—THE COMMON SAW-WORT.

Serratula tinctoria Linné.

THERE are vast areas of poor soil in northern Europe which from the dominant plants with which they are covered are known as heaths. The soil is generally deficient both in clay and in lime, and, as a consequence of the former deficiency, is non-retentive, not only of water, but also of other soluble or diffusible substances, such as some of the products of humus, which would, if present, render it less poor. On much highly elevated and often highly inclined ground, as especially in Scotland, the soil may be derived from disintegrated crystalline rocks and will consist of quartz sand, with spangles of mica and coarse particles of undecomposed felspar. In the absence of lime, any local interruption of the drainage, such as may be produced by a parting of clay in a series of sandstone beds, or by the formation of an ironstone pan, will generally give rise to more or less acid bogs or swamps. Where, as over a large portion of the low-lying inland area of Ireland, inadequate drainage is general, the extensive formation of peat alters the character of the vegetation. In the south of England, however, and especially in the county of Surrey, the heaths belong mainly to the Bagshot Sand formation—a fairly pure iron-stained sand—do not exceed 1,000 feet in altitude, and, except for small local bogs, are very dry. On the dry portions of these heaths the number of species of plants is not great. Ling (*Calluna vulgaris*) is often less dominant than the Fine-leaved Heath (*Erica cinerea*) ; and other prominent species in the association are the Dwarf Furze (*Ulex minor*), the Wood Sage (*Teucrium Scorodonia*), the Hare-bell (*Campanula rotundifolia*), and the Hedge Bedstraw (*Galium saxatile*). Less general or prominent are the Upright St. John's-wort (*Hypericum pulchrum*) and the Saw-wort (*Serratula tinctoria* Linné).

This last-named species may also occur in old dry pasture land, such as that of commons, and in open thickets ; but not under much shade, nor at any considerable altitude.

The genus to which it belongs includes some forty species spread over the Northern Temperate region of the Old World from Japan to Europe, though but a small proportion of the species advance beyond the confines of Asia, and only this one is British. They are perennials and in general habit resemble many of the species of the allied genus *Centaurea*. They have simple radical leaves and usually pinnatifid cauline ones, their generic name *Serratula*, which dates from Pliny, and its English equivalent *Saw-wort*, referring, as Gerard puts it, to the

“large leaves somewhat snipt about the edges like a sawe.”

The flower-heads are grouped in corymbose clusters and have the prominent spheroidal involucre of the Tribe. There are numerous, imbricate bracts which are neither hooked nor spinous, the inner ones being longer and membranous at their



THE COMMON SAW-WORT—continued.

tips; and the common receptacle bears bracteolar scales split longitudinally into linear bristles. The florets are all tubular and either crimson or, very rarely, white, and *gynodiæcious*, i.e. some plants have their flowers perfect, whilst in others they have imperfect anthers. There seems, however, to be a certain amount of variation in the sex-distribution of the flowers. Robert Brown, whose attention was directed to the question by the Rev. Robert Bree and Thomas Smith, describes some plants of our British species with all their stigmas abortive, so that the plant would then be truly diæcious. In this case the plants are readily distinguishable, the male plants having blue anthers and style-arms which do not spread apart, while the female plants have white anthers and spreading arms to the style. Both stigmas and anthers are very prominently exerted beyond the corolla. The fruit is oblong, compressed, and glabrous, and is surmounted by a pappus of many rows of stiff, rough hairs, generally coloured and sometimes branched in a feathery manner, the rows being of very unequal length, the innermost the longest.

Our species, *Serratula tinctoria* Linné, has a rather woody rhizome and a slender, erect, grooved or angular, leafy stem, two to three feet high, branching in a loose corymb. There are large lyrate-pinnatifid radical leaves with distant lobes and stiff but not prickly serratures to the margins of all the lobes. While these root-leaves may be from five to nine inches long, those on the stem are small and sessile. The flower-heads are ovoid and from half an inch to two-thirds of an inch across; and the bracts of the involucre are stiff and ciliate, the outer ones ovate and adpressed, the inner ones linear and tinged with red. The fruit is grey and the pappus a dirty white.

The plant gives a yellow colour to wool, for which purpose it was much used in Sweden in the time of Linnæus, this being the origin of his specific name *tinctoria*. The yellow, when fixed with alum, was said to be both beautiful and permanent; and, with the addition of a blue pigment, gave a better green, either for wool or silk, than either *Reseda Luteola* or *Genista tinctoria*. These excellent vegetable dyes should not be forgotten by those who can encourage cottage industries, their results being often more beautiful and more lasting than those of the cheaper aniline compounds.

It will be noticed that in the white-flowered variety represented on the right of our Plate the absence of the red pigment affects the colour of the involucre and even of the stem.

CCXCIV.—THE BROWN RADIANT KNAPWEED.

Centaurea Jacea Linné.

CENTAUREA is a large genus comprising some 470 species, widely distributed in all the continents and represented by more than 170 species in Europe, chiefly in the Mediterranean region, and by six in Britain. The three best-known of these are the blue Cornflower (*Centaurea Cyanus* Linné), the Great Knapweed (*C. Scabiosa* Linné), and the Black Knapweed (*C. nigra* Linné). The last two of these, though abundantly distinct botanically, do not seem to have been much discriminated in popular nomenclature; and the confusion has been facilitated by the occasional occurrence of forms of *C. nigra*, which usually has no ray-florets, with those structures. The Great Knapweed, with its pinnatifid leaves and large flower-heads, is especially common as a roadside plant on calcareous soils; while the Black Knapweed, with more erect growth, less lobed leaves, and smaller flower-heads, is common on heaths and pastures or in lowland meadows on sand, loam, or clay. The Brown Radiant Knapweed (*C. Jacea* Linné), the subject of our Plate, is even more readily overlooked, being mistaken for *C. Scabiosa*, or still more readily for one of the radiant forms of *C. nigra*. It is undoubtedly often of alien origin and is, therefore, omitted in some British Floras; but it seems to be as indigenous in Sussex meadows—as in the neighbourhood of Fairlight—as it is admittedly in Normandy and in Belgium. Mr. Dunn enumerates a score of alien species which have occurred more or less casually in Britain.

The genus includes both annuals and perennials and among the latter some are undershrubs. The species vary considerably in their leaves, which are in many cases spinously toothed like those of their near allies the Thistles. The spheroidal involucre, with numerous, imbricate, adpressed bracts, more or less membranous, often fringed, and sometimes spinous, is very characteristic, giving rise, as we shall see, to the majority of the vernacular names of *C. Scabiosa* and *C. nigra*. The common receptacle is flat and bears bristle-like or chaffy bracteolar scales, and all the florets are tubular; but there is generally an outer row of larger unsymmetrical ray-florets which are neuter, serving only to render the inflorescence as a whole the more conspicuous. The stamens have short filaments, which are hairy about the centre of their length, and anthers forming a tube almost as long as the corolla, its upper portion formed by coriaceous prolongations of the connectives. The style has no pollen-brush at its apex but a ring of hairs below the point where it ultimately forks.

The unfortunate Neapolitan botanist Cirillo, who, having taken an active part in the republican movement by which the Bourbons were expelled, was hanged by Nelson in 1799, was apparently the first to observe the interesting sensitive movements of the filaments in this genus, by means of which the pollen is swept from the tube of anthers. When the florets open the anthers have already split on



THE BROWN RADIANT KNAPWEED—continued.

their inner surfaces, so that the pollen lies in the tube. In most other *Compositæ* the style elongates and sweeps out the pollen by a terminal brush of expelling hairs. In this genus, however, as Cirillo observed, the filaments are irritable and contract one after the other, so that the tube of anthers is pulled jerkily down over the apex of the closed branches of the style, first from one side, then from another. If the mere weight of a crawling insect be imitated by brushing the hand lightly over the flower-head, a curious wriggling movement will be seen in all the disk-florets, owing to the attachment of the contractile filaments to the corolla-tubes. Experiment, however, goes to show that the sensitive part of the filament is that which is hairy, which would be touched by the proboscis of any insect probing for honey; and that the filaments are at first bowed outwards but contract with a writhing movement from ten to twenty per cent. of their length, and thus become more nearly straight. When artificial stimulation is applied, a ribbon-like stream of pollen will be seen to issue from the top of the anther-tube, followed by the apex of the style. Later the two stylar arms curl back, so that, failing insect visits, self-pollination takes place.

The fruits are attached to the common receptacle laterally, above their base: they are compressed and are usually surmounted by a pappus of short, slender, stiff, and rough hairs in several rows, of which the second is the longest.

The Brown Radiant Knapweed (*C. Jacea* Linné) is a perennial with simple leaves, the lower ones broad and slightly lobed. The flower-heads are apparently almost radiant and the involucre appears brown, its bracts having a rounded margin of membranous comb-like teeth pointing slightly outwards. It is later in coming into flower than the others, being seldom out till August.

Among the old popular names of these plants was *Bolleweed*, closely connected etymologically with the Greek *πάλλα*, *palla*, a ball, but now corrupted into *Bullweed*. *Codweed* meant that the flower-head was like a pudding-bag, the Celtic *cwd*: *Clobweed* is a literal rendering of the mediæval *Herba clavellata*: *Churl's-head* refers apparently to the rough bracts; and *Knapweed* is knob-weed, connected with the German *knopf*, the head. In some districts they are known as *Drumsticks*; but perhaps the most general genuinely popular name is *Hardheads*, which refers, according to Dr. Prior, to the ancient weapon known as a loggerhead, consisting of an iron spiked ball on a shaft.

As to the scientific name *Centaurea*, its origin is the same as that of the Gentianaceous genus *Centaurion*, and we need not refer again to the story of Chiron and Heracles, except to mention the ludicrous blunder in the German name *Tausend Gulden*, thousand sovereigns, based upon the notion that *Centaurea* was from *centum aureos*, a hundred gold-pieces.

CCXCV.—THE CORNFLOWER.

Centaurea Cyanus Linné.

IN the Linnæan arrangement of British plants the genus *Centaurea* forms an Order by itself termed *Polygamia Frustranea* on account of the general presence of neuter ray-florets. Although so fully alive to the importance of the stamens and carpels as to have based his whole system upon their number and grouping, Linné did not know the important part played by the insect-visitors of flowers in effecting their pollination, this being first demonstrated by Christian Conrad Sprengel in his "Geheimniss der Natur in den Befruchtung der Blumen," which was not published till 1793, sixteen years after the death of Linné. Nor was the full import of insect-pollination realised until Darwin showed the value of cross-pollination in improving the race. The utility to their possessor of the large and beautiful neuter florets in the ray of the Cornflower was not, therefore, then apparent, though we now recognise that the economy of material and energy effected by the non-development of stamens or carpels in these flowers is well expended in the production of the large corollas that so greatly add to the attractiveness of the whole inflorescence.

The whole genus *Centaurea*, like their allies the Thistles, show considerable xerophytic adaptation in the tendency to develop spines and the membranous character of bracts, bracteoles, or even flowers ; but no species, perhaps, exhibits this feature more than does the Cornflower (*Centaurea Cyanus* Linné). It is an annual or biennial with slender, grooved, and wiry stem, hoary with a flocculent mass of cottony hairs and with but a small leaf-system ; so that when it has developed its proportionately extensive series of flower-heads and their resultant fruits, it may be scorched up in the dry, sunny cornfields which it chiefly inhabits, its seed carrying on the race to another year. In the moister soil and partial shelter of a turnip-field it may follow up its first flowering in July with a second crop in October.

The tough, wiry stem seemingly gave rise to the curious barbarous name *Blaptisecula* or *Baptisecula*, which occurs in Brunfels (1530) and Tragus (1552), and is presumably derived from the Greek βλάπτω, *blapto*, I injure, and *secula*, dog-Latin for a sickle. Thus Turner explains it in his "Herball" in 1551, though thirteen years before he seems to be coquetting with another etymology. In his "Libellus," in 1538, he writes :—

"Cyanus a gallis teste ruellio blaium dicitur hanc ego herbam arbitror esse quam northumbria uocat a Blew-blaw aut a Blew-bottell, hanc corollis intexunt pueri eo tempore quo baptistæ sacra peraguntur."

"Cyanus is called by the French, according to Ruellius, blavius. I think this to be the plant that Northumberland calls a Blew-blaw or a Blew-bottell. The boys weave this into garlands at the season when the feast of the Baptist is celebrated."

In the Herball, however, he does not allude to St. John, but says merely :—

"Some herbaries call it baptisecula or blaptisecula because it hurteth sicles, which were ones called of olde writers *seculæ*."

This is the name that Henry Lyte rendered *Hurt-sickle*.



THE CORNFLOWER—continued.

It was, no doubt, the flask-like shape of the involucre that gave rise to the name *Bottle*, and the irregular-pointed lobes of the beautiful blue ray-florets explain *Ragged Sailors* and *Ragged Ladies*; but naturally it is the wondrous colour that, from the earliest times and in most countries, has suggested the names most generally used for the plant. The Greek *κύανος*, *kuanos*, the blue flower, *par excellence*, becomes Pliny's *Cyanus*. As Turner says in his "Names of Herbes":—

"Cyanus is named in greeke Cyanos, in english Blewbottel or a blewllaw, in duch Blaw Cornblowmen, in french Blaucole, or blauet, the herbe groweth among the corne."

In Italian and Spanish we still have *Ciano*; and *Cyanus*, remaining the scientific name of the plant from Fuchs to Ray and Morison, was retained by Linnæus as the specific name with an initial capital. There seems to be a very general Indo-European root *bla-* or *blau-*, meaning livid or blue, from which we have not only the German *blau*, and, of course, our own word and the Scots *bla*, but also the Provençal *blave* and the French *bleu*. From these we get the Scots name for the Cornflower, *Blawort*, and the French diminutives *Blaveole*, *Blaverolle*, *Blavert*, *Blaver*, *Blavet*, and *Bluet*. The intense blueness of these blossoms,

"Blue as the spring heaven,"

justifies the pleonastic *Bleu-bleu* of Normandy; and Turner's *Blew-blaw* is probably similarly pleonastic. So too we would suggest that *Corn-binks*, recorded as a Devonshire name for the plant by Messrs. Britten and Holland, may be really *Corn-blinks*, from the dazzling effect of the colour, and thus parallel to the graphic *Casse-lunettes*, break your spectacles, of the French.

In the dry, sunny summers of continental Europe the plant is—or was—more abundant as a weed than with us, so that it is for Germany, Holland, and Belgium emphatically the *Kornblume*, *Kornbluem*, or *Kornbloemen*. White, deep violet, and rose-coloured forms are often grown in gardens; but they are probably only recent escapes from cultivation when they appear elsewhere. The common blue form, in fact, is hardly known in Europe except as a cornfield weed; but is said to occur in woods in southern Russia and Asia Minor and may well be truly indigenous in the arid interior of the latter region.

The smaller, perfect, disk-florets with their conspicuous tubes of anthers are of a deep violet which serves only to emphasise the blueness of the ray. The common receptacle bears silvery membranous bracteoles, and the fruits are grey and silky and are surmounted by a dirty white or tawny pappus. The one shortcoming of these lovely flowers is that they have no scent.

This exquisite flower has sometimes been erroneously spoken of in England as the national flower of Germany; but is in fact a family badge of the house of Hohenzollern.

CCXCVI.—THE MUSK THISTLE.

Carduus nutans Linné.

THE fully-armed stems and leaves of the Thistles and their prodigious powers of multiplication and of dominating other vegetation make us think of them generally as only noxious weeds, the spread of which has to be restricted by every means from the personal industry of the cultivator to drastic Acts of the Imperial Parliament. The spread of one European species, the Milk Thistle (*Silybum Marianum* Gaertner), a very handsome plant with its leaves veined with white, over the Pampas of Banda Oriental and Argentina, to which it was introduced by man, was described by Darwin in his "Naturalist's Voyage."

"Probably several hundred square miles," he writes, "are covered by one mass of these prickly plants, and are impenetrable by man or beast. Over the undulating plains, where these great beds occur, nothing else can now live. . . I doubt whether any case is on record of an invasion on so grand a scale of one plant over the aborigines."

Another species, introduced into Australia, has spread in a similar manner. Its powerful root-system is described as penetrating and disintegrating hard volcanic rock, and the area covered by it is good for nothing but to contribute some little food for turkeys that feed upon its fruits.

The dominating power which these herbaceous plants have achieved has its interest for the botanist; and, were they not so troublesome as weeds, several species of Thistles would undoubtedly be much admired for their beauties of form and colour. In this respect no British species surpasses the Musk Thistle (*Carduus nutans* Linné).

Leaving on one side the Carline Thistles (*Carlina*), which are very distinct, Thistles form a natural group, often considered as a Tribe, *Carduineæ*. They are characterised by having flower-heads made up of a large number of florets, all tubular, with an involucre consisting of many rows of spinous bracts, and by a pappus on their fruits consisting of many rows of hairs not surrounded at their base, as are those of *Centaurea*, by the margin of the epigynous disk. Among these plants, the Milk Thistle, just mentioned, stands apart, forming the genus *Silybum*, in that its filaments are united; and of the remainder the Cotton Thistle (*Onopordum Acanthium* Linné), a handsome plant which, although not a native of Scotland, is now adopted by heralds as the emblem of that country, belongs to a genus which is clearly distinguished by having its fruits four-angled. The others, though sometimes divided into two or three genera—*Carduus*, *Cnicus*, and *Cirsium*—are not readily separable, so that it may be well to follow Babington's "Manual" and Messrs. Britten and Rendle's "List" in treating them all under *Carduus*. Of this genus, we may then say, there are some two hundred species, originally natives of the Northern Hemisphere, especially western Asia and Europe. The European species may be reckoned as over a hundred in number, and our British species as eleven. Many natural hybrids occur between them.



THE MUSK THISTLE—continued.

As thus limited the Thistles of the genus *Carduus* are erect or stemless herbaceous plants with spinous-toothed leaves, generally sessile, and often decurrent, forming spinous wings to the stem. The involucre is ovoid or globose ; its many imbricate bracts narrow, stiff, and spinous ; and its common receptacle deeply pitted and furnished with bristly bracteoles. The corolla is red, purple, or white, with five long lobes : the filaments are free and hairy in their middle parts : the anthers have a prolonged connective and generally toothed tails : the arms of the style are fused together for most of their length, with a ring of hairs at their base ; and the fruit is smooth, not angled, but surmounted by a pappus of hairs in many rows, united into a ring below. Partial diœcism occurs, chiefly in that section of the genus in which the pappus-hairs are feathery, sometimes separated as the genus *Cnicus*.

We have often seen masses of thistle-down, the tangled fruits of many heads rolling down a hill-side in the wind ; and the ease with which these fruits float in the air from field to field has necessitated legislation against the negligent farming which infects the neighbouring lands. The goldfinch is very fond of the fruits of Thistles, and in pulling the heads to pieces liberates many fruits from the pitted receptacle, besides those which it eats. The feathery parachute-like pappus will float these for some distance ; but the well-filled fruits will soon detach themselves by their own weight from the ring of the pappus. The plumed fruits of Thistle seen floating high up in the air far from the parent plant will generally be found to be empty aborted ones. The plant is thus adapted for dispersal by short steps rather than by long ones.

The Musk Thistle is a biennial, growing from one to three feet high, with an erect and but seldom branched stem, angular, furrowed, cottony, and partially winged. The leaves are usually hairy on both sides with woolly veins on the under surface, pinnatifid, with spinous-pointed segments, wavy and decurrent ; but the most striking feature of the plant is its large solitary drooping heads of deep magenta flowers, with a grey cottony involucre and a powerful musky odour, especially in sunny weather. This perfume, which proves very attractive to humble-bees, gave the plant from early times the name *Carduus muscatus*, while John Bauhin named it *C. nutans* from the equally striking droop of the handsome flower-heads.

On dry, fallow fields on chalk or sand—the grey stems and foliage affording a fine background to its flower-heads—it is not surprising that, in the absence of any decisive evidence to determine the species to which the name Scottish Thistle should apply, many artists have chosen this.

CCXCVII.—THE WILD SUCCORY.

Cichorium Intybus Linné.

THE Sub-Family *Ligulifloræ* form so homogeneous a group that Hoffmann puts them all into one Tribe, the *Cichorieæ*. They all have a white milky juice or latex; scattered leaves; and all their florets ligulate and perfect. The great majority of them have yellow flowers, and this is the case with some species in the genus *Cichorium*.

This genus comprises less than a dozen species, mostly natives of the Mediterranean region. They are perennial herbaceous plants, with tough, rigid stems branching in unilateral cymes, the branches terminating in flower-heads. The leaves are toothed or pinnatifid, radical, and cauline. The involucre is cylindrical and consists of two rows of bracts, the outer row of about five, short and adpressed, the inner of eight to ten, united at the base, longer and at first erect and convergent, but afterwards reflexed. The common receptacle is flat, naked or slightly hairy, and pitted; and there are a number of florets in each head. The anther-chambers have no tails and the upper part of the style and its slender arms are hairy. The smooth, obovate, compressed, striate fruits, crowded on the hardened receptacle and embraced by the stiff bracts of the involucre, are surmounted by a pappus of two rows of minute erect, obtuse, chaffy scales.

The origin of the names borne by our one British species, *Cichorium Intybus* Linné, is obscure. The name occurs in the Greek as *Κίχopa*, *Kichora*, *κιχόρια*, *kichoria*, and *κιχόρεια*, *kichoreia*; but is not clearly of any great antiquity; and the same may be said of *Intubus* or *Intybus* as a name for Endive. Pliny says:—

“Intybum in Ægypto Cichorium vocant,”
“In Egypt they call Intybus Cichorium”;

and there is an Arabic name *Chikouryeh*; but it is difficult to say whether the Greek word is of Arabic origin or *vice versâ*. Fuchs calls the wild plant *Intubum sylvestre*, Camerarius, *Intubus sylvestris*, whilst Turner, in his “*Libellus*,” gives both *Intubum* and *Intybus* as alternatives, adding that the English call it *Wylde Suckery*; and in his “*Names of Herbes*” he uses *Cichorium* and our modern spelling *Succory*. Matthioli uses *Cichorium* and Tragus *Cichorea*, as had Horace fifteen centuries before.

But if the origin of these old names is obscure, we have a clearer explanation of the German *Wegewarte*, the waiter-by-the-way, which we might think sufficiently obvious for a plant that so frequently rears aloft its pale blue blossoms by the dusty road. A maiden, we are told, waited weary weeks for the return of her betrothed, but finally sank exhausted and died by the roadside. Soon after there sprang up a plant unknown before; and when at length the lover returned he recognised in its starry blossoms the blue eyes of his lost Gretchen who had waited by the way.



THE WILD SUCCORY—continued.

Our species has a long fleshy tap-root, and spreads out oblong, lanceolate root-leaves with runcinate teeth (*i.e.* hooked backward like those of the Dandelion) and glandular hairs on their margins. The small upper leaves are sessile, ovate, cordate, and amplexicaul. The stem, zigzagging from side to side, is angular, grooved, and rough with bristly hairs, and may rise to a height of two or three feet.

Sir James Edward Smith has left us a record of his early attraction to this beautiful flower.

“From the earliest period of my recollection,” he writes, “when I can just remember tugging ineffectually with all my infant strength at the tough stalks of the Wild Succory, on the chalky hills about Norwich, I have found the study of nature an increasing source of unalloyed pleasure, and a consolation and a refuge under every pain.”

The flower-heads expand to an inch and a half in diameter, but only in fair weather and between certain hours. Linné gives these, for Upsala, as 5 to 10 a.m. ; Kerner, for Innsbruck, puts them at 6 or 7 a.m. to 2 or 3 p.m. The outer green bracts of the involucre are fringed with glandular hairs and beyond them project the flowers which, in the bud stage, have a maroon colour. The loose ranks of ligules expand to an exquisite shade of pure blue, much that of the *Nemophila*, far lighter than that of the ordinary variety of the Cornflower, more translucent than that of the Forget-me-not, but hardly to be exactly matched among British plants. Very rarely, the flowers are white ; and the blue ones fade by afternoon, or if gathered, into a dull white. Each ligule is five-toothed at the top and the anthers and stigmas share the blue colour of the corolla.

Though most commonly seen on the chalk, the Succory also occurs on sand and gravel ; and the cultivated plant differs in no essential from the wild form. The green leaves are occasionally employed as a spring salad instead of the nearly-allied Endive (*Cichorium Endivia* Linné) ; but in France the plants are commonly tied up and blanched like Lettuces and are then known as *Barbe du Capucine*. The chief use of the plant, however, is as an adulterant of Coffee, for which purpose the fleshy root is cut up, roasted, and ground. Direful stories are told, however, of the adulteration of the Chicory itself, not only with the root of the Dandelion, which is, perhaps, as good as the Chicory itself, but with carrot, mangel-wurzel, oak-bark, tan, mahogany dust, baked horse-liver, and Venetian red.

CCXCVIII.—SMALLER-FLOWERED GOAT'S-BEARD.

Tragopogon minor Miller.

THE genus *Tragopogon* comprises some thirty-five species, mostly natives of the North Temperate region of the Old World, nearly twenty being natives of Europe, but only two in our islands. They seem to be generally biennial herbs and abound in the milky latex characteristic of *Ligulifloræ*, which, in this genus, though rather bitter, especially when uncooked, is not acrid. They have edible tap-roots ; erect, sparingly branched stems ; and scattered, long, undivided, tapering leaves, which are sheathing at the base. Both stem and leaves are generally glabrous.

The flower-heads are large, solitary, and terminal, with from twenty to fifty yellow or purple flowers, and are remarkable for closing before noon. The bracts of the involucre are few in number, generally from eight to sixteen in two alternating rows, but all united at the base, narrow, and usually longer than the flowers, and about the same length as one another. The receptacle is flat in the flower stage, naked or fringed with hairs, and pitted with hollows in which the ovaries are imbedded. The corollas are all ligulate, ending in five teeth, the outer florets being slightly longer. The anther-chambers are tailed ; and the slender style is hairy on its upper portion and bifurcates into slender obtuse arms, which roll backward.

The most striking feature in these plants is the fruit, in which the special adaptation of the *Compositæ* for the dispersal of their seed by wind is carried to its highest pitch of elaboration. Each fruit is oblong, angular, and with rough striæ : the calyx-tube is prolonged into a slender beak, at least as long as the ovary, which is surmounted by the large pappus of about thirty spreading, feathery but rigid, branched hairs with unbranched tips. The hair-like branches of the pappus of the outer row of fruits interlace. As these fruits develop, the common receptacle that bears them becomes more convex, so that from a plane they become a cobweb-like sphere of rigid plumes ; and the ripe fruits are detached in succession by the shrinking of the cup-like sockets in which their bases are imbedded.

It was these rough, stiff plumes that gave the genus its original name *Tragopogon*, from the Greek *τράγος*, *tragos*, a goat, and *πώγων*, *pogon*, a beard. The name, which was used by Dioscorides and adopted as a Latin name by Fuchs and Matthioli, was translated by Cordus as *Barba hirci* and by Tragus in the diminutive *Barbula hirci* ; and, when first mentioning it as a British plant, Turner suggests that our species may be called *Goat's-beard*. His words, in the "Names of Herbes," are :—

"Barba Hirci named in greeke Tragopogon or Come, groweth in the fieldes aboute London plentuously, and it groweth muche in the middowes of Colon and in many places in duchland. The duch herbe hath some bitternes in the roote & a whyte seede, but oures is swete and hath blacke seede, therfore oures is the better herbe. It may be called in englishe gotes bearde."

It was probably also for the same reason that the plant got the name of *Joseph's Flower*, mentioned by Lyte and still in use in Sussex, since St. Joseph is generally represented as an old man with a long beard.



SMALLER-FLOWERED GOAT'S-BEARD—continued.

The early closing of the flower-heads is general in the genus and has gained our yellow-flowered species the soubriquet of *Jack-go-to-bed-at-noon*. The phenomenon interested Linnæus, who termed such plants “meteoric,” as being more subject than others to the influences of the weather ; and the botanists of a century ago amused themselves by drawing up “*Horologia floralia*,” or Flower Clocks, list of flowers which open and shut at successive hours.

Thus the Daisy is open from sunrise to sunset ; the Goat's-beard, at Upsala, from between 3 and 5 a.m. to 8 or 10 a.m. ; the Scarlet Pimpernel, from 7 a.m. till a little after 2 p.m. ; the White Water-lily, from 7 a.m. to 4 p.m. ; the Dandelion, from 7 a.m. to 5 p.m. ; the Mouse-ear Hawkweed (*Hieracium Pilosella* Linné), from 8 a.m. to 3 p.m. ; *Alsine rubra*, from 9 a.m. to 3 p.m. ; while many white flowers only become sweet-scented in the evening and some, like the cactus *Cereus grandiflorus* Miller, are expanded from about 9 p.m. to 10 a.m. These plants do not keep very precise time, being apparently affected by temperature, and their hours vary with latitude ; but the habit is no longer to be considered a mere “curiosity of plant life,” since we know that, in some cases at least, these hours of opening are those when their special insect-pollinators are abroad.

Linnæus's species *Tragopogon pratense* has its involucral bracts about the same length as its flowers. It grows from one to two feet in height, but is not so common as the species represented on our Plate. This, first discriminated by Philip Miller, has the bracts nearly twice the length of the flowers ; but, as it is often two feet high, Miller's name *minor* can only be considered true of the flowers, and we have, therefore, rendered it as Smaller-flowered Goat's-beard. It is fairly common in meadows, hedgerows, and waste-places, especially, but by no means exclusively, on a calcareous soil. Though its yellow tap-root is, as we have said, edible, it is that of its purple-flowered congener, *T. porrifolius* Linné (which occurs not uncommonly as an escape from cultivation), that is grown under the name of *Salsify*, and has been dignified with the complimentary cognomen of the Vegetable Oyster. The black-skinned roots of the allied *Scorzonera hispanica* Linné are often used instead of the true Salsify, which they are said to surpass as a very wholesome, easily digested, mildly aperient remedy in indigestion, biliousness, or febrile disorders.

CCXCIX.—THE DANDELION.

Taraxacum officinale Weber.

WITH finely-cut foliage and a profusion of golden blossoms produced for many months in succession and followed by a fruit of fairy-like lightness, the Dandelion is slighted mainly because it is everywhere. As Lowell wrote to it—

“ Dear common flower that grow’st beside the way,
Fringing the dusty road with harmless gold,
First pledge of blithesome May,
Which children pluck, and, full of pride, uphold,
High-hearted buccaneers, o’erjoyed that they
An Eldorado in the grass have found,
Which not the rich earth’s ample round
May match in wealth, thou art more dear to me
Than all the prouder summer-blooms may be.”

The genus *Taraxacum*, to which it is now referred, contains some twenty-five species, which have now achieved a widespread geographical distribution over Temperate regions in the South as well as in the North and even into Arctic latitudes, and exhibit many structural features of considerable interest. Their success is the result not only of their great reproductive powers but also of their extreme vitality and adaptable vegetative structure. The fleshy tap-root is perennial and as it increases in girth it alternately expands and contracts in length, so dragging the stem downwards and preventing it from ever rising much above ground. Abounding in a bitter latex, if injured, this root has great powers of repair, forming a callus over the wound from which adventitious buds are developed. The main stem or rhizome is very short and forms a sympodial cyme from which the rosette of radical leaves and the lateral flowering scapes originate. A new main bud is formed each year on this leafy axis, very much as in *Iris*, to develop in the following season. The leaves vary in form in the different species, but are all radical ; and the flower-heads are solitary on hollow leafless scapes or peduncles rising direct from the rhizome. The involucre consists of two series of bracts, the outer, few in number, imbricate, shorter, and either spreading or reflexed, the inner in one row, erect and equal. The common receptacle is at first flat, as in *Tragopogon*, naked and pitted, and becomes afterwards convex, as in that genus. The florets are numerous, our common species, *T. officinale* Weber, having from 200 to 300 in each flower-head ; and all are ligulate, yellow, and perfect. The strap-shaped corolla is five-toothed at its apex : the anther-chambers have no tails : the upper part of the style is pubescent ; and its slender arms become ultimately recurved. The floral mechanism is, in fact, that so general in this Family, in which cross-pollination by almost any insect-visitor is favoured at first by protandry and the sweeping of the pollen out of the anther-tube by the style ; but, failing such crossing, self-pollination is, as a last resource, secured. The fruits are compressed, and ribbed with an armature of minute projections along the upper half of each rib,



THE DANDELION—continued.

contracting abruptly at the top into a slender beak, which is surmounted by a pappus of many rows of radiating, soft, white, unbranched hairs.

The genus received its name *Taraxacum* from Adam Lonitzer or Lonicerus of Frankfort, a sixteenth-century botanist chiefly known from having had the Honey-suckles named after him. The name is derived apparently from the Greek *ταράσσω*, *tarasso*, I alter, and refers to the valuable alterative properties of the milky rhizome of our common Dandelion, to which it also owes its specific name *officinale*.

This species has a dark root ; runcinate leaves ; the corolla of the outer florets often brown on the back ; and the fruit some shade of brown ; but some five varieties are recognised. In the common form in cultivated ground the leaves are broad especially near the apex, the outer bracts are recurved, the inner ones have simple points, and the fruit is pale. In var. *levigatum*, found in sandy places, the leaves are a duller green, the outer bracts stand erect, the inner are pouched at their points, and the fruit is reddish-yellow. In var. *erythrospermum*, found in dry places, the leaves are dull green or glaucous, the outer bracts spreading, the inner ones pouched, and the fruit a bright red or dark brown. In var. *udum*, found in bogs or damp places, the outer bracts are first adpressed and then spreading, the inner with simple points, and the fruit a yellowish-green ; and in var. *palustre*, found on moist moorlands, the leaves are sometimes entire or have broad wavy lobes, the outer bracts are adpressed, the inner simple at the tip, and the fruit a pale yellow or brown.

The leaves certainly vary in thickness, internal structure, and colour, according as they grow in the sun or in shade. It is most probably from their irregular, backward-curving, pointed lobes, resembling the fierce jaws of the heraldic lion, that the plant obtained its mediæval name of *Dens leonis*, lion's tooth, which remains as *Dente de Leone* in Italian, *Diente de Leon* in Spanish, *Dente de Leão* in Portuguese, *Dent de Lion* in French, and *Dandelion* in English.

Linnæus described the flower-heads as expanding at Upsala between 5 and 6 a.m. and closing between 8 and 10 a.m. ; but at Innsbruck, according to Kerner, they keep the later hours of 6 or 7 a.m. to 2 and 3 p.m., and with us they seem still later.

When they have been fertilised, they go through a most interesting series of changes. The florets, withering, twist into a mass which keeps off the rain while the beak of the fruit elongates. Then the receptacle changes its form from flat or concave to convex and the bracts expand, bending through half a circle till they point downwards along the peduncle and the globe of down appears in all its beauty. Then it is that, while the drying receptacle squeezes off fruit after fruit, children assist with their breath and call the plant *Blowball*, *What's-a-clock*, or *Fortune-teller* ; until, when left bare, round, and white, it became the *Priest's crown* or *Swine's-snout* of former days.

The rhizome of the Dandelion, when roasted, is a useful substitute for Chicory ; and the leaves, when blanched, are valued on the Continent as a salad.

CCC.—ANALYTICAL DRAWINGS OF THE COMPOSITE FAMILY.

(*Compositæ*.)

CONSIDERING the number of species in the Family, the *Compositæ* include few useful plants. The edible tubers of the Jerusalem Artichoke (*Helianthus tuberosus* Linné), the roots and rhizomes of Salsify, Scorzonera, Chicory, and Dandelion, the leaves of these last two plants and those of Lettuce and Endive, the bases of the bracts of the flower-head of the Thistle-like true Artichoke (*Cynara Scolymus* Linné), wellnigh exhaust the list of articles of food. *Taraxacum*, *Arnica*, and Chamomile are the more important in a somewhat longer catalogue of minor drugs ; and Safflower (*Carthamus tinctorius* Linné) is the chief surviving dye-plant. On the other hand, the long list of favourite garden flowers, such as Asters, Sunflowers, Dahlias, Zinnias, Marigolds, and Chrysanthemums, serve to remind us that those beauties that were originally evolved to attract pollinating insects have been taken by us as the starting-points for our horticultural artificial selection. Though there are, within the limits of the Family, inconspicuous wind-pollinated flowers, such as those of the Wormwoods, and self-pollinating ones, such as Groundsel, the great majority of the Family show a far greater uniformity in their adaptations for insect-pollination than in those for seed-dispersal ; so that, whilst the former is almost a Family character, the latter is little more than generic.

In this Plate we have analyses of nine types belonging to as many different genera, which are arranged in the systematic order in which they have been described, with the exceptions that the Dandelion—to prevent the crowding of the Plate—has been placed at the end of the second line of figures ; and, for the same reason, three figures from a Thistle are placed at the end of the last line but one.

The first line of figures represents the Hemp Agrimony (*Eupatorium cannabinum* Linné), Fig. 1 being a capitulum, approximately natural size ; Fig. 2, a single floret, enlarged ; Fig. 3, the same in longitudinal section, showing the epigynous disk ; Fig. 4, the style, hairy at its base, and the same disk ; Fig. 5, three florets passing into the fruit stage, natural size ; and Fig. 6, a single fruit, also natural size.

The first three figures in the second line represent the Bur-marigold (*Bidens tripartita* Linné), Fig. 1 being the whole capitulum ; Fig. 2, a single floret, enlarged, with a bract ; and Fig. 3, a young fruit, also enlarged, showing the two barbed pappus-bristles. The remaining figures in this line represent the Dandelion (*Taraxacum officinale* Weber), Fig. 4 being the unexpanded flower-head, natural size ; Fig. 5, a single floret, slightly enlarged ; Fig. 6, the common receptacle, when convex and discharging its fruits, natural size ; and Fig. 7, a single fruit, slightly enlarged.

The third line of figures represents *Galinsoga parviflora* Cavanilles, Fig. 1 being a capitulum seen from above ; Fig. 2, a fruit with pappus ; Fig. 3, the involucre, and Fig. 4, the same, with fruits, all the figures being of natural size.



ANALYTICAL DRAWINGS OF THE COMPOSITE FAMILY—continued.

The fourth line analyses the Ox-eye Daisy (*Chrysanthemum Leucanthemum* Linné), Fig. 1 being the involucre, as seen from below ; Fig. 2, a longitudinal section through a capitulum ; Fig. 3, a portion of the common receptacle with some disk-florets ; Fig. 4, a single ray-floret ; Fig. 5, a disk-floret, of natural size ; and Fig. 6, the same enlarged.

The fifth line illustrates the Blue Cornflower (*Centaurea Cyanus* Linné), Fig. 1 being a neuter ray-floret ; Fig. 2, a perfect disk-floret ; Fig. 3, the same enlarged, in longitudinal section ; Fig. 4, the stamens, the rings of colourless hairs round the filaments not being shown ; Fig. 5, the capitulum, with the ray removed ; Fig. 6, a young fruit with the withered corolla ; Fig. 7, the head of fruits ; and Fig. 8, a single fruit enlarged, showing the stiff, bristly pappus.

The first five figures in the sixth line represent the Succory (*Cichorium Intybus* Linné), Fig. 1 being the involucre, as seen from below ; Fig. 2, a floret, natural size ; Fig. 3, the essential organs, showing the hairy upper portion of the style ; Fig. 4, a portion of the pitted surface of the common receptacle ; and Fig. 5, a fruit, enlarged. The last three figures in this line were drawn from one of the Plume Thistles (*Carduus lanceolatus* Linné), Fig. 6 being a floret, little more than natural size ; Fig. 7, the fruit detached from its pappus ; and Fig. 8, a section through the common receptacle, on which are some fruits.

The last line of four figures illustrates the Goat's-beard (*Tragopogon minor* Miller), Fig. 1 being an unexpanded flower-head showing the bracts of the involucre to be much longer than the florets ; Fig. 2, a floret, natural size ; Fig. 3, the same enlarged ; and Fig. 4, the receptacle on which two ripe fruits remain.

We feel that we have hardly done justice to the varied seed-dispersal mechanisms in the Family, so we will conclude with some words of Professor Douglas Campbell as to the superiority attained by *Compositæ*.

"This superiority," he says, "seems to be more or less due to their extraordinarily perfect devices for the transportation of their seeds. The numerous wind-borne seeds of the dandelion and thistles, the tenacious burs of the bur-marigold and burdock, together with the robust constitution of the plants themselves, have given these weeds an enormous advantage in the struggle for existence."

POSTSCRIPT

WHILE our book has been passing through the press we have recognised the inadequacy of the general acknowledgment of indebtedness to the help of others made in our Preface.

All the plants have, of course, been drawn from fresh specimens ; but it was not always easy to obtain some of the less common species in flower or fruit just when they were wanted ; and we wish to thank Miss Chawner and Messrs. C. Bucknell, C. E. Salmon, and J. A. Wheldon for kind assistance in this respect.

Though most of the analytical drawings were made from the artist's own dissections, it was thought desirable in some cases to supplement these where material was not available, and for this purpose use has been made of the *Flora Londinensis*, Le Maout and Decaisne's *Descriptive and Analytical Botany*, and Sowerby's original drawings for *English Botany*, which are preserved in the Botanical Department of the British Museum.

Much of the indebtedness of the letterpress to preceding works is obvious. Free use has been made of the early herbals, and, among modern Floras, of *English Botany*, Babington's *Manual*, and Hooker's *Student's Flora*. The writer wishes also to acknowledge his great obligations to Engler and Prantl's *Natürliche Pflanzenfamilien* ; Alcock's *Botanical Names for English Readers* ; the late Lord Avebury's *Notes on the Life History of British Flowering Plants* ; Mr. James Britten's edition of Turner's *Names of Herbes*, and the *Dictionary of English Plant-Names* by him and the late Robert Holland ; Mr. S. T. Dunn's *Alien Flora of Britain* ; Professor Earle's *English Plant Names from the Tenth to the Fifteenth Century* ; Dr. Daydon Jackson's edition of Turner's *Libellus* and his *Glossary of Botanic Terms* ; the late Dr. Prior's *Popular Names of British Plants* ; *Types of British Vegetation*, edited by Mr. A. G. Tansley ; Mr. John Weathers's *Practical Guide to Garden Plants* ; and Dr. J. C. Willis's *Manual and Dictionary of the Flowering Plants*.

He wishes also to thank Dr. Rendle and the other officers of the Botanical Department of the British Museum for much useful advice and assistance, and for facilities afforded for his work in their Department.

I. S. PERRIN

G. S. BOULGER

GLOSSARY

- Aberrant** (Latin *aberrans*, going astray), departing from the type.
- Abortive** (Latin *abortivus*), imperfectly developed, *e.g.* stamens without anthers.
- Absciss layer** (Latin *abscissus*, cut off), the layer of cells by which the fall of the leaf is effected.
- Accessory** (Latin *accessio*, an addition), applied to buds or other structures developed in addition to those usually present.
- Accrescent** (Latin *accrescens*, continuing to grow), especially applied to a calyx growing after the flowering stage, as in the Winter Cherry (*Physalis Alkekengi* Linné).
- Accumbent** (Latin *accumbens*, leaning against), applied to cotyledons which have their edges against the radicle.
- Acerose** (Latin *acer*, sharp), needle-shaped, as in the leaves of many Conifers.
- Achene** (Greek *a*, *a*, not; *χαίρω*, *chaino*, I gape), a small, dry, indehiscent carpel, as in the Lady's-mantle (*Alchemilla*) and Buttercups (*Ranunculus*).
- Achlamydeous** (Greek *a*, *a*, without; *χλαμὺς*, *chlamus*, a cloak), without a perianth.
- Acicle** (Latin *aciculus*, a little needle), a bristle, as on Brambles.
- Acicular**, needle-like, as in such leaves as those of Juniper.
- Acquired characters**, those not inherited, but resulting from influences during the life of the organism.
- Acropetal** (Greek *ἄκρος*, *akros*, summit; Latin *peto*, I seek), produced in succession from base to apex, *e.g.* the leaves on a shoot.
- Actinomorphic** (Greek *ἄκτις*, *aktis*, a ray; *μορφή*, *morphe*, form), star-shaped, polysymmetric; capable of bisection into similar halves in more than two planes.
- Acuminate** (Latin *acuminatus*, pointed), having a tapering point, *e.g.* the leaves of the Black Bryony (*Tamus communis* Linné).
- Acute** (Latin *acutus*), sharp, but not drawn out, as are the points of most leaves.
- Acyclic** (Greek *a*, *a*, not; *κυκλικός*, *kuklikos*, circular), not in whorls, spiral, as in the more primitive types of flower.
- Adaptive modifications**, those by which an organism is specially fitted for its surroundings, *e.g.* the succulence of xerophytes.
- Adherent** (Latin *adhaerens*, sticking to), united to a dissimilar part, *e.g.* receptacular tube to ovary in inferior ovary.
- Adnate** (Latin *adnatus*, grown to), applied to anthers united to the connective throughout their length; dorsifixed.
- Adpressed** (Latin *adpressus*, pressed against), appressed, especially applied to hairs lying flat against the surface.
- Adventitious** (Latin *adventitiuus*, additional), out of the normal order, not acropetal, *e.g.* roots not originating opposite the xylem bundles of the radicle, or buds not originating in leaf-axils.
- Aerial** (Latin *aër*, air), applied to stems or roots developed above ground.
- Æstivation** (Latin *æstivus*, belonging to summer), the manner in which the perianth-leaves are arranged in the flower-bud.

GLOSSARY

- Albumen** (Latin *albumen*, white of egg), the nutritive tissue in the seed, external to the embryo.
- Alien** (Latin *alienus*, foreign), a plant which, though not indigenous, has become naturalised.
- Alkaloid** (Arabic *al kali*, a base capable of neutralising an acid; Greek *εἶδος*, *eidos*, resemblance), a nitrogenous crystalline base occurring in the juices of plants and having an alkaline reaction.
- Alliaceous** (Latin *allium*, garlic), with an onion-like smell.
- Allogamy** (Greek *ἄλλος*, *allos*, another; *γάμος*, *gamos*, marriage), cross-fertilisation.
- Alpine** (Latin *alpinus*, pertaining to the Alps), growing on mountains above the limit of trees.
- Alternate** (Latin *alternatus*), as applied to foliage-leaves, should mean distichous, *i.e.* arranged in two vertical rows on the stem, no two leaves being at one level, but is often used for scattered, *i.e.* one leaf at each node; as applied to the parts of a flower, means with the parts of one whorl opposite the spaces between two parts in the next whorl.
- Altitude** (Latin *altitudo*, height), height above sea-level.
- Amentaceous** (Latin *amentum*, a strap), in a catkin.
- Amentiferous** (Latin *amentum*, a strap; *fero*, I bear), catkin-bearing.
- Amphibious** (Greek *ἀμφι*, *amphi*, on all sides; *βίος*, *bios*, life), living equally well on land or in water.
- Amphitropous** (Greek *ἀμφι*, *amphi*, on all sides; *τροπέω*, *tropeo*, I turn), applied to the ovule when so curved as to bring the apex or micropyle near to the base or chalaza.
- Amplexicaul** (Latin *amplexus*, embracing; *caulis*, a stem), applied to a leaf the auricles of which overlap on the side of the stem opposite to that to which it is attached.
- Analogy** (Greek *ἀναλογία*, *analogia*, likeness), resemblance in function or form but not in origin, *e.g.* the phylloclades of the Butcher's Broom (*Ruscus*) are analogous to leaves.
- Anastomosis** (Greek *ἀναστόμωσις*, *anastomosis*, an influx), the union of veins or any vessels so as to form a network.
- Anatomy** (Greek *ἀνά*, *ana*, up; *τομή*, *tomos*, cutting), the study of structure.
- Anatropous** (Greek *ἀνά*, *ana*, up; *τροπέω*, *tropeo*, I turn), applied to the ovule when reversed, so that the chalaza is at the apex and the micropyle at the base, *i.e.* near to the placenta.
- Androdicæcious** (Greek *ἀνδρὸς*, *andros*, of a man; *δύς*, *dis*, two; *οἶκος*, *oikos*, a house), having some flowers male and others, on different individuals, perfect.
- Andræcium** (Greek *ἀνδρὸς*, *andros*, of a man; *οἶκον*, *oikion*, a dwelling), the male organs of the flower; the stamens collectively.
- Andromonæcious** (Greek *ἀνδρὸς*, *andros*, of a man; *μόνος*, *monos*, one; *οἶκος*, *oikos*, a house), having some flowers male and others, on the same plant, perfect.
- Anemochore** (Greek *ἄνεμος*, *anemos*, wind; *χωρέω*, *choreo*, I go forward), a plant dispersed by wind.
- Anemophilous** (Greek *ἄνεμος*, *anemos*, wind; *φιλέω*, *phileo*, I love), pollinated by wind.
- Angiosperm** (Greek *ἄγγειον*, *angeion*, a receptacle; *σπέρμα*, *sperma*, a seed), a plant having its seed enclosed in an ovary.
- Angustisept** (Latin *angustus*, narrow; *septum*, a partition), with the septum across the lesser diameter, applied in the Family *Cruciferae* to such fruits as those of *Thlaspi*.
- Annual** (Latin *annualis*), lasting a year, completing a life-cycle within a year; formed during a year; dying at the close of a season's growth.
- Annular** (Latin *annulus*, a ring), ring-shaped,

GLOSSARY

- Anterior** (Latin, in front), in the flower referring to the side farthest from the stem.
- Antero-posterior**, from front to back, applied to the median plane of the flower, which passes through the axis and the bract.
- Anthela** (Greek ἀνθήλη, *anthele*, a flower), a cymose inflorescence in which the lateral branches overtop the main axes, as in the Meadow-sweet and many Rushes.
- Anther** (Greek ἀνθηρὰ, *anthera*, blooming), the part of a stamen which contains the pollen.
- Anthophore** (Greek ἄνθος, *anthos*, a flower; φέρω, *phoreo*, I bear), an elongated internode between the calyx and the corolla, as in *Lychnis*.
- Anthotropic curvature** (Greek ἄνθος, *anthos*, a flower; τροπέω, *tropeo*, I turn), bending of the flower-stalk during flowering.
- Antipetalous** (Greek ἀντί, *anti*, against; πέταλον, *petalon*, a petal), opposite, or superposed, to a petal.
- Apetalous** (Greek α-, *a-*, without; πέταλον, *petalon*, a petal), without petals.
- Apex**, the free extremity of an organ.
- Apiculate** (Latin *apiculum*, a little point), ending in a short, sharp point.
- Apocarpous** (Greek ἀπο, *apo-*, from; καρπός, *karpos*, fruit), with distinct (*i.e.* not united) carpels.
- Appendiculate** (Latin *appendiculatus*), having an appendage, *e.g.* the anthers in Heaths.
- Appendix** (Latin, an addition), applied to the barren extremity of the spadix in *Arum maculatum* and similar plants.
- Appressed**. See **Adpressed**.
- Aquatic** (Latin *aqua*, water), living in water.
- Aqueous tissue**, thin-walled, colourless parenchyma in which water is stored.
- Arachnoid** (Greek ἀράχνη, *arachne*, a spider; εἶδος, *eidos*, resemblance), covered with a cobweb-like mass of white hairs.
- Arborescent** (Latin *arborescens*), reaching the size of a tree.
- Archichlamydeæ** (Greek ἀρχή, *arche*, beginning; χλαμὺς, *chlamus*, a cloak), a Sub-Class of Dicotyledones characterised by the primitive character of the perianth, which is either absent or has petals not united.
- Arenicolous** (Latin *arena*, sand; *colo*, I inhabit), growing in sandy places.
- Aril**, a fleshy outgrowth on the surface of a seed.
- Articulated** (Latin *articulatus*), jointed.
- Artificial classification**, any system depending upon one set of characters.
- Ascending**, directed upwards; sub-erect.
- Asexual** (Greek α-, *a-*, not; Latin *sexualis*, pertaining to sex), neuter, applied to flowers, such as the outer florets in the Cornflower (*Centaurea Cyanus* Linné), which have neither stamens nor carpels.
- Assimilation** (Latin *assimulo*, I make like), the process by which food-materials are converted into protoplasm.
- Asymmetric** (Greek α-, *a-*, not; σύμμετρος, *summetros*, symmetric), used of flowers which cannot be bisected into two similar halves along any plane.
- Atlantic**, a name applied to a florula consisting of species confined to the proximity of the Atlantic, also known as Lusitanian.
- Atrophy** (Greek α-, *a-*, without; τροφή, *trophe*, nourishment), abortion or non-development from want of nourishment.
- Atropous** (Greek α-, *a-*, not; τροπέω, *tropeo*, I turn), not bent, applied to the ovule, as in *Polygonum*.
- Attenuate** (Latin *attenuatus*, thinning), tapering, generally downwards, as in the leaf of the Daisy.
- Auricle** (Latin *auricula*, the lobe of the ear), a lobe at the base of a leaf.

GLOSSARY

- Autochthonous** (Greek αὐτόχθων, *autochthon*), indigenous.
- Awn**, a bristle-like appendage.
- Axil** (Latin *axilla*, the arm-pit), the angle between the stem and a leaf springing from it.
- Axillary**, produced in the axil.
- Baccate** (Latin *bacca*, a berry), berry-like.
- Ballistic fruits** (Latin *ballista*, a catapult), fruits which scatter their seeds by their elasticity.
- Balsam** (Greek βάλσαμον, *balsamon*), a fragrant resin, generally containing cinnamic acid.
- Bark**, an ambiguous term, sometimes used for the rind, *i.e.* all the tissues exterior to the cambium, which are removed in the artificial "barking" of a tree; and sometimes for the periderm and secondary cortex external to it, the tissues which may exfoliate naturally.
- Barren**, sometimes applied to staminate or to neuter flowers, neither of which produce seed.
- Base**, the attached extremity of any organ.
- Basifixed** (Latin *basis*, base; *fixus*, fastened), applied to anthers which are attached to the filament by their bases only.
- Basifugal**, acropetal.
- Basipetal** (Latin *basis*, base; *peto*, I seek), succeeding one another from the apex towards the base.
- Bast-fibres**, the fibres of the pericycle, forming the fibrous inner "bark" and furnishing most textile substances.
- Batology** (Greek βάτος, *batos*, a bramble; λόγος, *logos*, science), the study of *Rubi*.
- Berry**, strictly an inferior, syncarpous, fleshy fruit without core or stone, as in the Gooseberry.
- Bicarpellary**, or **Bicarpellate**, of two carpels.
- Biennial** (Latin *biennium*, two years), taking parts of two years for completion of growth, *e.g.* the Turnip, or the aerial shoots of Brambles.
- Bifid** (Latin *bifidus*), two-cleft.
- Bijugate** (Latin *bi-*, twice; *jugum*, a yoke or pair), applied to a pinnate leaf having two pairs of leaflets.
- Bilabiate** (Latin *bi-*, two; *labium*, a lip), applied chiefly to corollas, such as those of the *Labiatae* and of Honeysuckle, in which the united petals separate above into two groups, thus forming two lips.
- Binominal System** (Latin *bi-*, two; *nomina*, names), often inaccurately written binomial, Linne's system of giving every plant two names, one generic and the other specific.
- Bipartite** (Latin *bipartitus*), deeply divided into two lobes, as are the petals of the Chickweed.
- Bipinnate** (Latin *bi-*, twice; *pinnatus*, feathered), applied to a compound leaf divided into a series of leaflets arranged along each side of a common axis or *rhachis*, the leaflets being again divided in a similar manner.
- Biserrate** (Latin *bi-*, twice; *serratus*, saw-edged), with a toothed margin of which the teeth are themselves toothed.
- Bisexual**, perfect; having both stamens and carpels.
- Biternate** (Latin *bi-*, twice; *ternatus*, in threes), when a leaf is divided into three divisions each divided into three, the arrangement being palmate.
- Blade**, the lamina, limb, or flattened expanded part of a leaf.
- Bletting**, softening in ripening, as in the fruits of the Medlar.
- Bloom**, often used for the waxy excretion on stems, leaves, or fruits, as in the Raspberry, Cabbage, and Plum.
- Bole**, the main stem of a tree.
- Bostryx** (Greek βόστρυξ, *bostrux*, a ringlet), a cymose inflorescence in which the branch to one side is uniformly the more vigorous.

GLOSSARY

Bract (Latin *bractea*, a thin metal plate), a leaf in the region of the inflorescence, often reduced and having generally a flower-bud in its axil.

Bracteate, having bracts.

Bracteole, a minute secondary bract on the pedicel.

Bud, the nascent state of a shoot or flower in which the apex of an axis is over-arched by rudimentary leaves.

Bulb, a fleshy underground bud consisting of a small rudiment of a stem enclosed by few or many narrow or broad scales and producing a tuft of roots below.

Bulbil, a small bulb-like structure produced above ground, as in the axils of the Tiger Lily and the inflorescences of some species of *Allium*.

Bullate (Latin *bullula*, a bubble), rising in hollow dome-like swellings between the veins, as in the leaf of the Savoy Cabbage.

Bur, a fruit provided with hooked prickles, which aid in its dispersal by animal agency.

Burr, a woody outgrowth produced by a dormant bud in the bark of the Beech, Holly, etc.

Bursicle (Latin *bursicula*, a little purse), the pouch holding the retinacula in some Orchid flowers.

Caducous (Latin *caducus*, falling), falling early, *e.g.* the sepals of the Poppy.

Calcicole (Latin *calx*, chalk; *colo*, I inhabit), calciphilous.

Calcifugal (Latin *calx*, chalk; *fugio*, I flee), shunning calcareous soil, *e.g.* Heather.

Calciphilous (Latin *calx*, chalk; Greek *φιλέω*, *phileo*, I love), flourishing on calcareous soil, *e.g.* *Clematis Vitalba* Linné.

Calciphobe (Latin *calx*, chalk; Greek *φοβέω*, *phobeo*, I fear), calcifugal.

Calycifloræ (Latin *calyx*, a cup, from Greek; *flos*, a flower), a Series of Dicotyledones named from the petals and stamens springing from a receptacular disk or cup called the calyx-tube.

Calyx (Greek *κάλυξ*, *kalux*, a cup), the sepals collectively, *i.e.* the outermost floral whorl.

Calyx-tube, in most cases, a tubular outgrowth of the floral receptacle common to the sepals, petals, and stamens, and, therefore, more accurately termed the receptacular tube.

Cambium (Latin *cambio*, I change), a layer of growing cells between the wood and the bark of an exogenous stem.

Campanulate (Latin *campanula*, a little bell), bell-shaped, applied to such a calyx as that of the Henbane (*Hyoscyamus niger* Linné), or to such corollas as those of *Campanula*.

Campylotropous (Greek *καμπύλος*, *kampulos*, curved; *τροπή*, *trope*, a turn), applied to an ovule when bent on itself like a horseshoe.

Capillary (Latin *capillaris*), hair-like, slender, *e.g.* the filament in Grasses.

Capitate (Latin *capitatus*, having a head), applied to the stigma when forming a simple terminal round knob, as in the Primrose; but sometimes used in the sense of *capitulate*.

Capitulate, forming a capitulum.

Capitulum (Latin, a little head), the close-set head of small florets in *Compositæ*, etc., often miscalled a flower.

Capsule, a dry, dehiscent fruit, typically superior and syncarpous.

Carina (Latin, keel), the two more or less united anterior petals of a papilionaceous flower.

Carinate, keeled.

Carpel (Greek *καρπός*, *karpós*, fruit), a female sporophyll, or ovule-bearing leaf in the flower.

GLOSSARY

- Carpellate**, having carpels, applied to the female flower in diclinous plants.
- Carpophore** (Greek καρπός, *karpos*, fruit ; φορέω, *phoreo*, I carry), a prolongation of the floral axis between the carpels, as in *Geranium*. In the *Umbelliferae* it is generally bifurcate.
- Caryophyllaceous**, applied to corollas of five long-clawed petals, as in the Family *Caryophyllaceae*.
- Casual**, a non-naturalised alien, such as the weeds introduced in foreign seed.
- Cataphyllary leaves** (Greek κατὰ, *kata*, down ; φύλλον, *phullon*, a leaf), the rudimentary scale-like leaves on the lower parts of stems.
- Catapult fruit**, ballistic fruit, dispersing their seed by their own elasticity.
- Catkin**, a deciduous inflorescence of unisexual apetalous sessile flowers.
- Caudicle** (Latin *caudicula*, a little tail), the slender stalk-like base of a pollinium in Orchids.
- Caulescent** (Latin *caulis*, a stalk), having a stem which elongates, as in a shade form of Primrose.
- Cell**, a nucleated unit-mass of protoplasm ; in plants generally enclosed in a membrane or wall.
- Cell-sap**, the watery contents of the vacuoles in the cell.
- Cellular**, made up of cells.
- Cellulose**, a carbo-hydrate or compound of carbon, hydrogen, and oxygen, of which the cell-wall is originally composed.
- Cell-wall**, the membrane enclosing a cell.
- Censer-action**, the jerking out of a few seeds from capsules opening at the top as their dry stalks sway in the wind.
- Centric** (Latin *centrum*, a centre), applied to the symmetry of leaves, such as those of Rushes, which are similarly constructed on all sides.
- Centrifugal** (Latin *centrum*, and *fugio*, I flee), developing from the centre outwards, as in the opening of cymose inflorescences.
- Centripetal** (Latin *centrum*, and *peto*, I seek), developing towards the centre, as in the opening of racemose inflorescences.
- Chalaza** (Greek χάλαζα, *chalaza*, a tubercle), the structural base of the ovule where its coats spring from below the nucellus.
- Chalazogamous** (Greek χάλαζα, *chalaza* ; and γάμος, *gamos*, marriage), where, as in most *Cupuliferae*, the pollen-tube in fertilisation enters the chalaza instead of the micropyle.
- Chalk-glands**, glands excreting a solution of carbonate of lime, as in some Saxifrages.
- Chasmogamous** (Greek χάσμα, *chasma*, a gaping opening ; γάμος, *gamos*, marriage), applied to flowers which open, in contradistinction to cleistogamous.
- Chlorosis** (Greek χλωρός, *chloros*, green), a disease, caused by want of iron, which produces a yellowing of the foliage.
- Choripetalous** (Greek χωρίς, *choris*, separately ; πέταλον, *petalon*, a petal), with separate petals ; polypetalous.
- Chorisis** (Greek χώρισις, *chorisis*, separating), the splitting or "doubling" of a floral leaf.
- Cincinnus** (Latin, a curl), a unilateral cyme branching alternately to the right and left.
- Circumnutation** (Latin *circum*, around ; *nutatio*, nodding), the outward bending of growing axes in a spiral direction.
- Circumscissile** (Latin *circum*, around ; *scissilis*, cutting), splitting along a circular transverse line, as in the fruit of the Pimpernel.
- Cirrhose** (Latin *cirrhus*, a tendril), ending in a tendril.
- Cladode** (Greek κλάδος, *klados*, a branch), a flattened leaf-like branch, a phylloclade, as in the Butcher's Broom.

GLOSSARY

- Cladoptosis** (Greek κλάδος, *klados*, a branch ; πτώσις, *ptosis*, falling), the shedding of branches.
- Clavate** (Latin *clava*, a club), club-shaped.
- Clavellate** (Latin *clavellatus*), like a little club.
- Claw**, the narrowed base of a petal: short in the Rose, long in the Wallflower.
- Cleistogamous** (Greek κλειστός, *kleistos*, shut ; γάμος, *gamos*, marriage), applied to flowers, as in the Violet, Sundew, etc., which pollinate themselves and never open.
- Cleistogene** (Greek κλειστός, *kleistos*, shut ; γεννάω, *gennao*, I produce), cleistogamous.
- Clove**, a young bulb developed in the axil of a bulb-scale.
- Cod**, an Old English word for pod.
- Coherent** (Latin *cohærens*, clinging to), united, used of similar parts.
- Collecting hairs**, hairs within the flower which serve to collect pollen.
- Column**, the structure formed by the union of stamens and style in Orchids.
- Coma** (Latin, the hair), the tuft of hairs on a seed, as in the Willows and Willow-herbs.
- Commensal** (Latin *cum*, with ; *mensa*, a table), living together under conditions mutually beneficial, as in the case of the mycorrhiza on roots of Flowering Plants.
- Commissure** (Latin *commissura*, a seam), the adherent inner faces of the two carpels in the fruit of the *Umbelliferae*.
- Complete**, used of the flower when having both calyx and corolla.
- Compound flower**, a misleading obsolete term for the capitulum or inflorescence of crowded florets in the *Compositæ*.
- Compound inflorescence**, one having two orders of branches, *i.e.* having its branches branched.
- Compound leaf**, a leaf having more than one articulation and thus generally divided into distinct leaflets.
- Compound umbel**, an umbel of umbels, the inflorescence of most *Umbelliferae*.
- Conducting tissue**, the loose tissue often filling the canal of the style and nourishing the pollen-tube.
- Conduplicate** (Latin *conduplicatus*, folded together), folded like the two halves of a sheet of note-paper.
- Cone**, generally applied to the collection of spirally-arranged seed-bearing scales in the *Coniferae*.
- Congener** (Latin, of the same race), a species of the same genus.
- Coniferous** (Latin *conus*, a cone ; *fero*, I bear), cone-bearing, belonging to the *Coniferae*.
- Connate** (Latin *connatus*, born together), united, generally to similar parts ; coherent, as of the opposite leaves in some Honeysuckles and in *Blackstonia*.
- Connective** (Latin *connectivus*, fastened together), the central portion of an anther between its pollen-sacs.
- Connivent** (Latin *connivens*, winking), converging and coming very close together.
- Contorted** (Latin *contortus*, twisted together), with one leaf rolled over the next and twisting upwards, as in the æstivation of the corolla in *Convolvulus*.
- Convergent** (Latin *con*, together ; *vergens*, bending), approaching one another.
- Convolute** (Latin *convolutus*, rolled together), applied to the æstivation when each leaf overlaps one margin of the next.
- Cordate** (Latin *cordatus*, heart-shaped), applied to the base of leaves, as in *Tamus communis* Linné.
- Coriaceous** (Latin *corium*, hide), leathery.
- Cork**, an outer tissue with cell-walls altered so as to be elastic and impermeable, and with cells chiefly filled with air, serving as a check on transpiration, chiefly on the older surfaces of roots and stems.

GLOSSARY

- Cork-cambium**, phellogen, the generating layer of the cork.
- Cork-warts**, lenticels, spots or lines in the cortical tissue where gaseous exchange is possible between the air and the intercellular spaces of the cortex.
- Corm** (Greek κορμός, *kormos*, a trunk), a short, solid underground stem, resembling a bulb externally, but generally consisting of a single internode; a short rhizome, as in *Crocus* and *Arum*.
- Corolla** (Latin diminutive from *corona*, a crown), the petals collectively.
- Corona**, or **Coronet**, the ligular outgrowths from the inner surfaces of the perianth, as in *Narcissus*.
- Cortex** (Latin), the middle layer of tissue in the axis of the higher plants between the central stele and the epidermis.
- Corymb** (Greek κόρυμβος, *korumbos*, a cluster), a raceme of flowers in which the lower flowers are brought to the same level as those formed later, by the greater length of their stalks.
- Corymbose**, corymb-like, flat-topped, applied to cymes as well as to racemes.
- Cosmopolitan** (Greek κόσμος, *kosmos*, the world; πολίτης, *polites*, a citizen), of world-wide distribution.
- Cotyledon** (Greek κοτυληδών, *kotyledon*, a hollow cup), a seed-leaf.
- Coumarin**, the fragrant principle of the Tonka-bean (*Coumarouna odorata* Aublet), occurring also in a variety of other plants; the smell of new-mown hay.
- Cremocarp** (Greek κρεμάω, *kremao*, I hang; καρπός, *karpos*, fruit), the fruit of the *Umbelliferae*, consisting of two carpels which hang from a carpophore.
- Crenate** (Latin *crenatus*, scalloped), with rounded marginal teeth.
- Crisped** (Latin *crispus*, curled), with the margin so expanded that it will not lie flat, but is thrown into folds, as in Curly Kale.
- Cross**, a hybrid.
- Cross-pollination**, the pollination of the stigma of one flower with pollen from another.
- Cruciate** (Latin *cruciatus*, cross-shaped), used chiefly of the corolla of the *Cruciferae*.
- Crucifer** (Latin *crux*, a cross; *fero*, I bear), a member of the Family *Cruciferae*.
- Cruciferous**, belonging to the *Cruciferae*.
- Cruciform**, cruciate.
- Crumpled**, much and apparently irregularly folded, as in the aestivation of the petals of Poppies.
- Cryptogamia** (Greek κρυπτός, *kryptos*, hidden; γάμος, *gamos*, marriage), Flowerless Plants, *i.e.* ferns, mosses, fungi, and algæ.
- Crystalloid** (Greek κρύσταλλος, *krustallos*, ice; εἶδος, *eidōs*, resemblance), an angular, crystal-like protein body, swelling up into a rounded form when moistened.
- Cuneate** (Latin *cuneatus*, wedge-shaped), applied to the base of leaves, as in the Planes.
- Cup**, cupule.
- Cupule** (Latin *cupula*, a little cup), the united involucre bracts around the base of the fruit in the *Cupuliferae*, *e.g.* the cup of the Acorn.
- Curvinerved**, with curved veins, generally diverging and converging, as in the leaves of the Lily-of-the-valley.
- Cuticle** (Latin *cuticula*, a little skin), the outer layer of the outer cell-walls, impregnated with cutin.
- Cutin** (Latin *cutis*, the skin), a substance allied to cellulose, but less permeable.
- Cutting**, a severed branch used as a means of artificial vegetative reproduction.
- Cyathium** (Greek κύαθος, *kuathos*, a wine-cup), the little cup-shaped involucre of *Euphorbia*, the Spurges, enclosing several male and one female flower and having crescentic glands on its margin.
- Cyclic** (Greek κυκλικός, *kuklikos*, in a circle), whorled, as opposed to spiral.

GLOSSARY

- Cyme** (Greek *κῦμα*, *kuma*, a wave), a definite or centrifugal inflorescence, in which the central terminal flower expands first.
- Cymose**, having the nature of a cyme.
- Cypsela** (Greek *κυψέλη*, *kypsēle*, a box), the fruit of the *Compositæ*, an inferior, syncarpous, indehiscent, one-seeded, achene-like structure, closely resembling the nut.
- Day-position**, the diaheliotropic or horizontal position of nyctitropic leaves during the day.
- Deciduous** (Latin *decido*, I fall down), falling in season, as, in the case of petals, after pollination; and, in the case of foliage-leaves, in autumn, contradistinguished from "evergreen."
- Declinate** (Latin *declinatus*, bent downward), generally applied to stamens lying to one side of the flower.
- Decomound** (Latin *decompositus*, much divided).
- Decurrent** (Latin *decurrens*, running down), as when the base of a leaf is continued as a wing down the stem, as in many Thistles.
- Decussate** (Latin *decussatus*, crossed), applied to leaves at one node over the spaces between those at the next, as in the two-leaved (opposite) whorls of *Labiata* and the three-leaved ones of *Juniperus*.
- Definite**, as referring to the number of parts, such as stamens, few; as referring to branching, cymose, the growth of each axis being definitely arrested by the development of its terminal bud, as into a flower.
- Dehisce** (Latin *dehisco*, I yawn), to split along a definite line.
- Dehiscence, Complete**, the splitting of fruits so as to disclose their seeds.
- Dehiscence, Incomplete**, the splitting of fruits into mericarps or one-seeded portions not further dehiscent.
- Dehiscent**, splitting, as anthers or most ripe dry fruits, if containing more than one seed.
- Deltoid** (Latin *deltoides*, resembling the Greek capital letter Δ, Delta, in outline).
- Denizen**, a plant suspected to have been artificially introduced, although well established.
- Dentate** (Latin *dentatus*, toothed), used of leaf-margins in which the teeth point outward.
- Dermatogen** (Greek *δέρμα*, *derma*, skin; *γένναι*, *gennao*, I produce), the embryonic epidermis, or outer layer in the axis of the higher plants.
- Dextrin**, a soluble carbo-hydrate produced by the alteration of cellulose, named from its right-handed deflection of the plane of polarisation.
- Diadelphous** (Greek *δι*, *di*-, two; and *ἀδελφός*, *adelphos*, a brother), applied to stamens when they appear to be united in two groups, as in the one separate and nine united stamens in many *Leguminosæ*.
- Diageotropic** (Greek *διὰ*, *dia*-, through; *γῆ*, *ge*, the earth; *τρόπος*, *tropos*, turning), placing themselves at right angles to the direction of the attraction of gravitation, *i.e.* horizontal.
- Diagonal plane**, in floral symmetry, a plane bisecting the flower between the antero-posterior and lateral planes.
- Diaheliotropic** (Greek *διὰ*, *dia*-, through; *ἥλιος*, *helios*, the sun; *τρόπος*, *tropos*, turning), placing themselves at right angles to the direction of incident light, *i.e.* generally approximately horizontal.
- Diandrous** (Greek *δῖς*, *dis*, two; *ἀνδρὸς*, *andros*, of a man), with two stamens.
- Diastase** (Greek *διάστασις*, *diastasis*, separation), an enzyme which converts starch into sugar.
- Dichasial** (Greek *δῖς*, *dis*, two; *χάζω*, *chazo*, I diverge), applied to cymes, with two flower-bearing branches of equal strength on either side of the terminal flower, *e.g.* *Stellaria Holostea* Linné.
- Dichasium**, a dichasial cyme.

GLOSSARY

- Dichlamydeous** (Greek *δῖς*, *dis*, two; *χλαμῦς*, *chlamus*, a cloak), having both calyx and corolla.
- Dichogamous** (Greek *δίχα*, *dicha*, in two; *γάμος*, *gamos*, marriage), applied to a flower in which the anthers and stigmas mature at different times.
- Diclinous** (Greek *δῖς*, *dis*, two; *κλίνη*, *kline*, a bed), unisexual, having stamens and carpels in different flowers.
- Dicotyledon** (Greek *δῖς*, *dis*, two; *κοτυληδών*, *kotyledon*, a seed-leaf), a member of the Class Dicotyledones, in which there are almost universally two cotyledons to the embryo.
- Didynamous** (Greek *δῖς*, *dis*, two; *δύναμις*, *dunamis*, strength), with four stamens, two longer than the other two, as in *Labiatae*.
- Digitate** (Latin *digitus*, a finger), palmate, with leaflets diverging from the base like the fingers of the hand, as in the Horse-chestnut.
- Dimerous** (Greek *δῖς*, *dis*, two; *μερὸς*, *meros*, a part), with parts in twos, as in the flower of the Enchanter's Nightshade (*Circea*).
- Dimidiate** (Latin, halved), used of anthers which are one-lobed, containing two, instead of the usual four, pollen-sacs, as in the Mallows.
- Dimorphous** (Greek *δῖς*, *dis*, two; *μορφή*, *morphe*, form), occurring under two forms, used especially of heterogony, such as that of the Primrose, in which two forms of flower occur, one with long style and lower stamens, the other with short style and higher stamens.
- Diœcious** (Greek *δῖς*, *dis*, two; *οἶκος*, *oikos*, a house), having stamens and carpels on distinct individual plants, as in the Willows and Poplars.
- Diplostemonous** (Greek *διπλός*, *diploos*, twofold; *στήμων*, *stemon*, a stamen), with stamens in two whorls, the outer alternating with the petals and the inner alternating with those of the outer whorl.
- Disk**, any outgrowth of the floral receptacle within the flower, other than the floral leaves, sepals, petals, stamens, and carpels, such as the nectaries, the large one-sided mass in the flower of the Mignonette, etc.
- Disk-florets**, the central florets in the Tubulifloral *Compositae*, such as the Daisy, as opposed to the outer, *ray*, florets.
- Dispersal-mechanism**, the different contrivances by which plants scatter their seeds.
- Dissepiment** (Latin *dissepimentum*, a partition), the inrolled margins of contiguous carpellary leaves forming a partition dividing the ovary into chambers.
- Distal** (Latin *disto*, I stand apart), the free extremity of any organ, that most distant from its base of attachment.
- Distichous** (Greek *δῖς*, *dis*, two; *στίχος*, *stichos*, of a rank), in two vertical rows, as in the leaves of *Iris*.
- Distinct**, not united.
- Distractile** (Latin *distractus*, divided), widely separated, as in the two anther-lobes in *Salvia*.
- Diurnal** (Latin *diurnus*, daily), belonging to day, as opposed to night, used of the expanded position of "sleeping" leaves.
- Divaricate** (Latin *divaricatus*, very divergent).
- Divergence, Angle of**, the angle between two succeeding organs in one whorl or spiral.
- Domatium** (Greek *δομάτιον*, *domation*, a little house), hollows or protective coverings for useful insects or mites, such as the tufts of hair on the veins of the Linden leaf.
- Dominant** (Latin *dominans*, mastering), predominant, applied ecologically to species which are so abundant as to give a physiognomy or *facies* to the plant-association; or in Mendelian crossing to forms which are more numerous than others produced by the same cross.

GLOSSARY

- Dormant** (Latin *dormio*, I sleep), applied especially to buds the shooting of which is deferred.
- Dorsal** (Latin *dorsalis*, belonging to the back), the surface turned away from the axis; the lower surface of a leaf; the outer suture of a pod, etc.
- Dorsifixed**, fixed by the back, adnate; applied to anthers.
- Dorsiventral**, so placed as to have an upper or ventral and a lower or dorsal surface, as in sprays of foliage, or ordinary horizontal leaves.
- Double flowers**, those in which the petaloid parts are unusually increased in number, sometimes by *chorisis* or branching, but most commonly by petalody of the stamens.
- Drepanium** (Greek *δρέπανον*, *drepanon*, a sickle), a uniplanar homodromous unilateral cyme, one, that is, in which the branches are all in one plane, and produced successively all on one and the same side, as in the Rushes.
- Drip-tip**, the acuminate tip of a leaf which drains its surface.
- Drupaceous**, more or less resembling a drupe.
- Drupe** (Latin *drupa*, an olive), a stone-fruit, as in *Prunus*, of one superior carpel, with skin or *epicarp*, flesh or *mesocarp*, stone or *endocarp*, and one, or rarely two, seeds.
- Drupel**, a miniature drupe, as is each of the carpels in the Blackberry or Raspberry.
- Duramen** (Latin, hardness), the heart-wood.
- Ebracteate**, without bracts.
- Echinulate** (Latin diminutive adjective from *Echinus*, a sea-urchin), covered with minute spines, applied to the pollen-grains of the Mallows.
- Ecological**, environmental.
- Ecology** (Greek *οἶκος*, *oikos*, a house; *λόγος*, *logos*, science), the study of plants in relation to their environment.
- Economic Botany**, the study of the uses of plants to man, whether as food, medicine, clothing, or building material, etc.
- Edaphic** (Greek *ἐδαφος*, *edaphos*, the ground), belonging to the soil.
- Elaboration** (Latin *elaboratio*, persevering labour), the changes of the crude sap and other food-materials converting them into food.
- Emarginate** (Latin *emarginatus*, having lost its edge), applied to leaves with a notch at the apex, *e.g.* the petal of a Rose.
- Embryo** (Greek *ἐμβρυον*, *embruon*, an unborn animal), the rudimentary plant within the seed.
- Embryo-sac**, the cell within which the embryo originates.
- Emergence**, a multicellular outgrowth from the more superficial tissues, such as prickles.
- Endemic** (Greek *ἐν*, *en*, in; *δῆμος*, *demos*, a district), confined to one region.
- Endocarp** (Greek *ἐνδον*, *endon*, within; *καρπός*, *karpos*, fruit), the inner layer of the pericarp, *e.g.* the "stone" in a drupe.
- Endogamous** (Greek *ἐνδον*, *endon*, within; *γάμος*, *gamos*, marriage), fertilisation by pollen from another flower of the same plant.
- Endogenous** (Greek *ἐνδον*, *endon*, within; *γένος*, *genos*, production), arising from deep-seated tissues, *e.g.* roots.
- Endopleura** (Greek *ἐνδον*, *endon*, within; *πλευρά*, *pleura*, the membrane lining the ribs), the tegmen, or inner coat of the seed.
- Endosperm** (Greek *ἐνδον*, *endon*, within; *σπέρμα*, *sperma*, seed), that portion of the albumen of the seed which develops within the embryo-sac.
- Entire**, without teeth or lobing, applied to leaf-margins.
- Entomophilous** (Greek *ἐντομος*, *entomos*, an insect; *φιλέω*, *phileo*, I love), pollinated by insects.

GLOSSARY

- Envelopes, Floral**, the calyx and corolla.
- Environment**, the surrounding conditions of life, such as soil, temperature, atmospheric moisture, etc.
- Enzyme** (Greek ἐν, *en*, in; ζύμη, *zume*, yeast), an unorganised or soluble ferment, such as diastase.
- Epicalyx** (Greek ἐπὶ, *epi*, upon; κάλυξ, *kalux*, a cup), a whorl of leaves below the calyx, either of bracteoles or of stipules, as in the Strawberry and Mallows.
- Epicarp** (Greek ἐπὶ, *epi*, upon; καρπός, *karpos*, fruit), the outer layer of the pericarp, *e.g.* the skin of stone-fruits.
- Epidermis** (Greek ἐπὶ, *epi*, upon; δέρμα, *derma*, skin), the outer layer of cells covering the herbaceous parts of a plant.
- Epigeal** (Greek ἐπὶ, *epi*, upon; γῆ, *ge*, the earth), applied to cotyledons which rise above ground and function as green leaves.
- Epigynous** (Greek ἐπὶ, *epi*, upon; γυνή, *gune*, a woman), applied to petals and stamens in flowers with an inferior ovary, springing from the receptacular tube which is adherent to the ovary.
- Epinastic** (Greek ἐπὶ, *epi*, upon; νάστος, *nastos*, close pressed), when the upper, outer, or dorsal surface of a dorsiventral organ grows more rapidly than the other, as in the inward arching of the leaves of a bud.
- Epipetalous** (Greek ἐπὶ, *epi*, upon; πέταλον, *petalon*, a petal), applied to stamens, adherent to the petals.
- Epiphyllous** (Greek ἐπὶ, *epi*, upon; φύλλον, *phullon*, a leaf), applied to stamens, adherent to the perianth-leaves.
- Epiphyte** (Greek ἐπὶ, *epi*, upon; φυτόν, *phuton*, a plant), a plant growing upon another but not parasitically.
- Equitant** (Latin *equitans*, riding), applied to the folding of leaves, when one leaf is conduplicate and its two edges are astride of those of the next leaf, as in *Iris*.
- Ericoid**, applied to leaves, resembling Heath (*Erica*), small, leathery, and with inrolled margins.
- Erose** (Latin *erosus*, gnawed), with torn edges, *e.g.* the petals of Pinks.
- Essential organs**, the stamens and carpels, as being essential to seed-production.
- Etærio** (Greek ἑταιρεία, *hetaireia*, companionship), a fruit made up of many apocarpous carpels, such as those of the Buttercup, Blackberry, Columbine, or Rose.
- Etiolation** (French *etiolé*, blanched), the condition of blanching and elongation produced by the exclusion of light, as in cultivated Sea Kale or Celery.
- Evergreen**, retaining the leaves until after a new set have developed.
- Exalbuminous** (Latin *ex*, without; *albumen*, the white of an egg), having no albumen.
- Exogenous** (Greek ἐξ, *ex*, out; γένος, *genos*, production), produced from outer layers of tissue, as is the secondary wood of dicotyledonous and gymnospermous stems, and as are all leaves.
- Exotic** (Greek ἐξωτικός, *exotikos*, foreign), not indigenous.
- Exserted** (Latin *exsertus*, protruded), applied to stamens, projecting beyond the corolla.
- Exstipulate**, without stipules.
- Extorse** (Latin *extrorsus*, turned outward), applied to anthers, dehiscing towards the periphery of the flower.
- Facies** (Latin *face*, form), the general aspect of a plant or of a flora.
- Family**, an assemblage of closely allied genera, a subdivision of an Order, used by Engler in the sense in which Order has been commonly employed by British botanists.
- Fasciation** (Latin *fascis*, a bundle of rods), an abnormal fusion of several stems into a flat ribbon-like structure.

GLOSSARY

- Fasciculate** (Latin *fasciculus*, a little bundle), clustered, as in the root-tubercles of *Ænanthe*, and the leaves of the Larch.
- Fastigate** (Latin *fastigatus*, sloping to a point), with erect branches, as in the Irish Yew and the Lombardy Poplar.
- Ferment** (Latin *fermentum*, leaven), a substance or unicellular plant setting up rapid chemical change in a relatively large body of matter, such as diastase and yeast.
- Fertilisation**, the penetration of the embryo-sac by the pollen-tube and consequent union of the sperm-cell and the germ-cell which results in the formation of the embryo.
- Fibro-vascular bundle**, a strand of vessels, often associated with tough fibres, *e.g.* the veins in leaves.
- Filament** (Latin *filamentum*, a thread), the stalk of the stamen.
- Filiform** (Latin *filum*, a thread; *forma*, shape), thread-like.
- Fimbriate** (Latin *fimbria*, fringe), fringed.
- Fistular** (Latin *fistula*, a pipe), hollow.
- Flaccid** (Latin *flaccidus*, flabby, wilted).
- Flora**, when spelt with a small f, the plants of any definite area, period, or set of conditions considered collectively; when spelt with a capital F, a work describing or enumerating the plants of a flora.
- Floral envelopes**, the calyx and corolla.
- Floret**, a little flower, chiefly used for the minute flowers crowded together in the flower-head or capitulum of *Compositæ*.
- Florula**, a diminutive of *flora* or *Flora*, used in the same way for the plants of a small area, or for a description of them.
- Flower**, an axis or branch bearing sporophylls (*i.e.* spore-bearing leaves, such as stamens and carpels), with or without floral envelopes (*i.e.* sepals and petals).
- Foliage-leaves**, ordinary green leaves, as distinguished from leaf-scales and the modified floral leaves (bracts, sepals, petals, stamens, and carpels).
- Follicle** (Latin *folliculus*, a little bag), a carpel containing more than one seed and dehiscing, when ripe, down the ventral suture only, as in *Delphinium*.
- Formation**, the natural vegetation occupying a habitat with constant characters, climatic or edaphic, which determine the plants in it.
- Fruit**, the fertilised gynæceum of a flower together with any adherent parts.
- Fruticose** (Latin *frutex*, a shrub), shrubby.
- Fugacious** (Latin *fugax*, fleeting), soon perishing or falling, *e.g.* the corolla of Flax.
- Funicle** (Latin *funiculus*, a slender cord), the stalk of an ovule or seed.
- Furcate** (Latin *furcatus*, forked).
- Fusiform** (Latin *fusus*, a spindle; *forma*, shape), spindle-shaped, tapering at both ends, as in the root of some Radishes.
- Gall**, an abnormal growth caused by the puncture of an insect, *e.g.* the Oak-apple.
- Gamopetalous** (Greek γάμος, *gamos*, marriage; πέταλον, *petalon*, a petal), having the petals united.
- Gamophyllous** (Greek γάμος, *gamos*, marriage; φύλλον, *phullon*, a leaf), having the perianth-leaves united.
- Gamosepalous** (Greek γάμος, *gamos*, marriage; and σέπας, *sepal*), having the sepals united.
- Generic**, belonging to, or characteristic of, a genus.
- Genetic spiral**, the line passing through the bases of the leaves on a shoot in the order of their development.
- Geniculate** (Latin *geniculatus*, with knees bent), applied to stems, as in *Polygonum*, bending sharply at the nodes.

GLOSSARY

- Genus**, a group of closely related species.
- Geophyte** (Greek γῆ, *ge*, the earth; φυτόν, *phuton*, a plant), a perennial plant much of the development and life of which is subterranean.
- Geotropism** (Greek γῆ, *ge*, the earth; τροπή, *trope*, turning), curvature due to the influence of gravitation.
- Geotropism, Negative**, growing away from the centre of gravity, as do most stems.
- Geotropism, Positive**, growing towards the centre of gravity, as do most roots.
- Germ-cell**, a female reproductive cell, also known as the ovum or egg-cell.
- Germination** (Latin *germen*, a bud), the sprouting of a seed, or of a pollen-grain.
- Gibbous** (Latin *gibbus*, humped), with a pouched base, as in the lateral sepals of the Wallflower.
- Glabrescent**, becoming glabrous.
- Glabrous** (Latin *glaber*, without hair).
- Gland**, a thin-walled superficial structure, unicellular or multicellular, secreting some special secretion.
- Glandular hair**, a hair with an enlarged apex containing some special secretion.
- Glaucous** (Greek γλαυκός, *glaukos*, blue-grey), covered with a blue-grey excretion of wax, as are the fruits of Plum and Grape and the leaves of many sea-side plants.
- Glomerule** (Latin *glomerulus*, a little ball), a sub-sessile axillary cyme, as in the Box.
- Glume** (Latin *gluma*, chaff), rigid bracts, as in Grasses.
- Gonophore** (Greek γόνος, *gonos*, offspring; φορέω, *phoreo*, I carry), an elongation of the floral axis below the stamens so that they and the carpels are carried up on a short stalk.
- Guard-cells**, the two active cells regulating the aperture of a stomate.
- Gymnosperm** (Greek γυμνός, *gymnos*, naked; σπέρμα, *sperma*, seed), a plant with naked seeds, *i.e.* with no closed carpel or stigma, a member of the Division *Gymnospermia*.
- Gynæceum** (Greek γυναικείον, *gunaikeion*, the women's quarters in a house), the carpels of a flower considered collectively.
- Gynandrous** (Greek γυνή, *gune*, a woman; ἀνὴρ, *aner*, a man), having the stamens and carpels united, as in Orchids.
- Gynobasic** (Greek γυνή, *gune*, a woman; βάση, *basis*, a pedestal), rising from the base in the centre of a ring of carpels, applied to the style in *Labiata*, etc.
- Gynodioecious** (Greek γυνή, *gune*, a woman; δῖς, *dis*, two; οἶκος, *oikos*, a house), having some flowers female and others, on other individuals, perfect.
- Gynomonœcious** (Greek γυνή, *gune*, a woman; μόνος, *monos*, one; οἶκος, *oikos*, a house), having some flowers female and others, on the same plant, perfect.
- Gynophore** (Greek γυνή, *gune*, a woman; φορέω, *phoreo*, I carry), an elongation of the floral axis below the gynæceum.
- Habit** (Latin *habitus*, appearance), general mode of growth, size, texture, and direction.
- Habitat** (Latin *habitatio*, dwelling-place), the locality in which a plant grows (now preferably termed its station); or the kind of locality in which it grows, such as salt-marshes, sand-dunes, heaths, bogs, pastures, etc.
- Hair**, a slender outgrowth from an epidermal cell, somewhat becoming multicellular.
- Half-equitant**, when the folded margins of a leaf are astride one margin of the next leaf.
- Half-inferior**, when the receptacular tube is adherent only to the basal half of the ovary, as in Saxifrages, applied either to calyx or ovary.
- Half-superior**, the same as half-inferior.
- Halophyte** (Greek ἅλς, *hals*, salt; φυτόν, *phuton*, a plant), a plant growing in salt soil, either of the sea-shore, near salt-springs, or in saline deserts.

GLOSSARY

- Hastate** (Latin *hasta*, a spear), halberd-shaped, *i.e.* with the auricles pointing outwards, as in the leaves of some Docks.
- Haustorium** (Latin *haurio*, I draw water), an organ by which parasitic plants attach themselves to the host-plant.
- Head**, the capitulum, or inflorescence of the *Compositæ*.
- Heart-wood**, the older central discoloured wood of a dicotyledonous tree.
- Heliotropism** (Greek ἥλιος, *helios*, the sun; τροπή, *trope*, turning), curvature due to the influence of light.
- Heliotropism, Negative**, turning away from light.
- Heliotropism, Positive**, turning towards light.
- Hemiparasite** (Greek ἡμι-, *hemi*, half; παράσιτος, *parasitos*, a parasite), a plant which is partly nourished parasitically.
- Herbaceous**, not woody, as applied to plants or stems; or green, not otherwise coloured, as applied to leaves.
- Herbaceous perennial**, a perennial plant with an underground stem sending up annual shoots which die down to the ground in the autumn.
- Hermaphrodite**, perfect, having both stamens and carpels in the same flower.
- Heterochlamydeous** (Greek ἕτερος, *heteros*, other; χλαμὺς, *chlamus*, a cloak), with calyx and corolla unlike.
- Heterochromous** (Greek ἕτερος, *heteros*, other; χρῶμα, *chroma*, colour), applied to the inflorescence of *Compositæ*, when the ray and disk florets are of different colours, as in the Daisy.
- Heterodromous** (Greek ἕτερος, *heteros*, other; δρόμος, *dromos*, a race-course), applied to unilateral cymes which branch alternately to either side of the main axis.
- Heterogony** (Greek ἕτερος, *heteros*, other; γόνος, *gonos*, offspring), the existence of two or more forms of the same species differing reciprocally in the relative lengths of their filaments and styles, as in the Primrose and Purple Loosestrife.
- Heterophyllous** (Greek ἕτερος, *heteros*, other; φύλλον, *phullon*, a leaf), having more than one kind of leaf, as in the Arrow-head and Water Crowfoots.
- Heterostyly**, heterogony.
- Hexamerous** (Greek ἕξ, *hex*, six; μέρος, *meros*, a part), having the floral leaves in sixes.
- Hexandrous** (Greek ἕξ, *hex*, six; ἀνδρὺς, *andros*, of a man), having six stamens (of equal length).
- Hilum** (Latin *hilum*, a trifle), the little scar on the testa of seeds marking the attachment to the funicle or placenta.
- Hirsute** (Latin *hirsutus*, hairy), with long hairs.
- Hispid** (Latin *hispidus*, bristly), with rough or stiff hairs or bristles.
- Histology** (Greek ἱστός, *histos*, a web; λόγος, *logos*, science), the study of tissues.
- Homochlamydeous** (Greek ὁμός, *homos*, similar; χλαμὺς, *chlamus*, a cloak), having all the perianth-leaves similar, as in the White Lily and Rushes.
- Homochromous** (Greek ὁμός, *homos*, similar; χρῶμα, *chroma*, colour), having ray and disk florets the same colour, as in *Chrysanthemum segetum* Linné.
- Homodromous** (Greek ὁμός, *homos*, similar; δρόμος, *dromos*, a race-course), applied to unilateral cymes which branch always on the same side of each successive axis.
- Homogamous** (Greek ὁμός, *homos*, similar; γάμος, *gamos*, marriage), maturing the pollen and the stigmas simultaneously, also termed synacmic.
- Homology** (Greek ὁμός, *homos*, similar; λόγος, *logos*, ratio), identity of origin or of structural type.
- Honey-dew**, a solution of sugar voided by aphides while sucking the leaves of the Linden and other plants.
- Honey-guides**, lines or rows of dots on petals converging towards nectaries and thus directing the pollinating insects.

GLOSSARY

- Honey-leaves**, floral leaves modified into nectaries, as in the Christmas Rose.
- Hose-in-hose**, a doubling of the corolla, so that a second occurs inside the first, and so on, as occasionally occurs in Primroses.
- Host**, the plant attacked by a parasite.
- Humus** (Latin, the soil), leaf-mould, decomposed organic matter in the soil.
- Humus-plants**, saprophytes, plants living in, and feeding mainly on, humus, generally by means of mycorrhizæ, such as the Bird's-nest Orchid.
- Hybrid** (Latin *hybrida*, a mongrel), a plant resulting from the pollination of the stigma of one species by the pollen of another.
- Hydathode** (Greek ὕδωρ, *hudor*, water; ὁδός, *odos*, a way), a water-stomate.
- Hydrochores** (Greek ὕδωρ, *hudor*, water; χωρίς, *choris*, apart), plants dispersed by water.
- Hydrophilous** (Greek ὕδωρ, *hudor*, water; φιλέω, *phileo*, I love), pollinated by water.
- Hydrophyte** (Greek ὕδωρ, *hudor*, water; φυτόν, *phuton*, a plant), a water-plant.
- Hygroscopic** (Greek ὑγρός, *hugros*, moist; σκοπέω, *skopeo*, I perceive), absorbing moisture, with a resultant change of form.
- Hypertrophy** (Greek ὑπέρ, *hyper*, above, extra; τροφή, *trophē*, food), abnormal enlargement by over-nutrition.
- Hypha** (Greek ὑφή, *huphe*, a web), the delicate thread or spawn of a fungus.
- Hypocotyl**, or **hypocotyledonary axis**, the tigellus or axis between the crown of the root and the cotyledons.
- Hypoderm** (Greek ὑπὸ, *hupo*, under; δέρμα, *derma*, skin), the tissues immediately below the epidermis.
- Hypogeal** (Greek ὑπὸ, *hupo*, under; γῆ, *ge*, the earth), applied to cotyledons which remain as food-reservoirs within the sprouting seed.
- Hypogynous** (Greek ὑπὸ, *hupo*, under; γυνή, *gune*, a woman), applied to petals and stamens when inserted beneath a superior ovary.
- Hyponastic** (Greek ὑπὸ, *hupo*, under; ναστός, *nastos*, close pressed), when the under, inner, or ventral surface of a dorsiventral organ grows faster than the dorsal, as in the opening of buds.
- Imbricate** (Latin *imbrex*, a tile), overlapping like the tiles of a house; in æstivation, when one leaf is wholly external and one wholly internal.
- Imparipinnate** (Latin *impar*, unequal; *pinnatus*, feathered), pinnate with a terminal leaflet.
- Imperfect**, unisexual.
- Included** (Latin *inclusus*, shut in), used of stamens which do not project beyond the corolla.
- Incomplete**, with no perianth or one of only a single whorl.
- Incumbent** (Latin *incumbens*, leaning on), used of the radicle when it rests against the back of one of the cotyledons.
- Indefinite**, of number of parts, *e.g.* stamens, more than twenty; of an inflorescence, acropetal or centripetal, the terminal bud being the last to unfold.
- Indehiscent**, not splitting.
- Indigenous** (Latin *indiges*, native).
- Inferior**, as used of calyx, not adherent to the ovary; as of ovary, enclosed in an adherent receptacular tube.
- Inflated**, as used of calyx, so enlarged as to leave a space between it and the corolla.
- Inflorescence**, the various groupings of flowers on a system of flowering branches.
- Innate** (Latin *innatus*, inborn), basifixed, used of anthers attached at the apex of the filament.
- Insertion**, somewhat unfortunately used for the modes in which sepals, petals, stamens, or carpels spring from the receptacle, or anthers are attached to filaments.

GLOSSARY

- Insolation** (Latin *insolo*, I expose to the sun), exposure to direct sunlight.
- Interaxillary**, between the axils.
- Intercalary** (Latin *intercalaris*, to be put in between), used of growth between two masses of permanent tissue.
- Interfoliar**, between opposite leaves.
- Internode** (Latin *inter*, between; *nodus*, a knot), the portion of a stem between two nodes.
- Interpetiolar**, applied to stipules between two opposite leaves, as in *Galium*.
- Interruptedly pinnate**, a pinnate leaf with small pinnæ alternating with larger ones, as in *Agrimonia* and the Potato.
- Introrse** (Latin *introrsus*, turned inward), used of anthers bursting towards the centre of the flower.
- Inulin**, a soluble carbo-hydrate found in *Inula* and other *Compositæ*.
- Involucel**, a secondary involucre, enclosing only part of an inflorescence.
- Involucral**, belonging to the involucre.
- Involucre** (Latin *involucrum*, a wrapper), a series of bracts, in one or more whorls, below an inflorescence, as in the *Anemone*, the *Umbellifera*, and the *Compositæ*.
- Involute** (Latin *involutus*, rolled up), having the margins rolled inwards, as in the leaves of Water-lilies and Violets.
- Irregular**, an ambiguous term, the use of which we have avoided, it being generally used of monosymmetric or asymmetric flowers, but sometimes of the latter only.
- Isomerous** (Greek *ἴσος*, *isos*, equal; *μέρος*, *meros*, a part), having the same number of parts in the different floral whorls.
- Jugum** (Latin, a yoke), a pair of leaflets in a pinnate leaf; a ridge on the fruits of the *Umbellifera*.
- Keel**, the two anterior petals of the *Papilionatæ*, which are more or less united.
- Labellum** (Latin, a little lip), an enlarged petal or union of petals at the front of a monosymmetric flower which serves as a landing-place for visiting insects, as in Orchids and *Labiata*.
- Laciniate** (Latin *lacinia*, a lappet), cut into narrow lobes, as are the petals in *Lychnis Flos-cuculi* Linné.
- Lacustrine** (Latin *lacus*, a lake), inhabiting standing water.
- Lamina** (Latin, a thin leaf), the blade of a leaf.
- Lanceolate** (Latin *lanceolus*, a little lance), narrow and tapering to the apex.
- Lateral plane**, a plane of floral symmetry at right angles to the median or antero-posterior plane.
- Latex** (Latin, juice), the milky juice, generally white, but sometimes coloured, in such plants as Poppies, Spurges, and the ligulifloral *Compositæ*.
- Laticiferous** (Latin *latex*, juice; *fero*, I bear), containing latex.
- Latisepate** (Latin *latus*, broad; *septum*, a partition), having the partition across the broader diameter, a distinctive character of certain Cruciferous fruits.
- Lax** (Latin *laxus*, loose), applied especially to inflorescences in which the flowers are some distance apart.
- Layering**, propagating by pegging down branches to the ground until they root.
- Leader**, the terminal main shoot in a monopodial tree, such as a Conifer.
- Leaf**, a lateral outgrowth from the stem, produced exogenously and in acropetal succession and differing in form from the stem that bears it.
- Leaflet**, a leaf-like portion of a compound leaf.
- Leaf-scar**, the scar left on the fall of a leaf.
- Leaf-sheath**, the sheathing base of some leaves, especially prominent in *Umbellifera*.
- Leaf-stalk**, petiole.

GLOSSARY

- Legume** (Latin *legumen*, pulse), a fruit consisting of a single, generally many-seeded, carpel, dehiscing down both sutures, characteristic of the *Leguminosæ*.
- Lenticel** (Latin diminutive from *lens*, a lentil), a lens-shaped corky spot on the bark of trees, between the loose cells of which transpiration takes place ; a cork-wart.
- Lenticular**, lens-shaped.
- Liane**, a name of Spanish origin, for the luxuriant woody-stemmed climbing plants of tropical forests.
- Liber** (Latin), the inner bark, often containing strong tough fibres ; bast.
- Lichen** (Greek *λεῖχην*, *leichen*), a symbiotic union of the green cells (*gonidia*) of a low type of Algæ with the hyphæ and fructification of a fungus.
- Lignification** (Latin *lignum*, wood ; *facio*, I make), the hardening and thickening of the walls of cells by deposits of lignin.
- Lignin**, a compound of carbon, hydrogen, and oxygen, insoluble in water or ether, but soluble in alcohol and in alkalis, which renders cellulose harder and less flexible, thus forming wood.
- Ligulate**, strap-shaped.
- Ligule** (Latin *ligula*, a little tongue), a strap-shaped appendage to some leaves, *e.g.* to the petals of *Lychnis* and *Cuscuta*, and to the foliage-leaves of Grasses ; used also for the strap-shaped ray-florets in *Compositæ*.
- Ligulifloral**, having all the florets ligulate, characteristic of one of the larger divisions of the *Compositæ*, such as the Dandelion.
- Limb**, the lamina or blade of a leaf or a petal ; or the free portions of a gamophyllous perianth-whorl.
- Linear** (Latin *linea*, a line), very narrow, with parallel sides and at least four times as long as it is broad, applied to leaves such as those of Lavender, most Grasses, etc.
- Linnæan System**, Linnæus's classification of plants which depends primarily upon the number, union, or relative lengths of the stamens, and secondarily on the number of styles.
- Lobe** (Greek *λοβός*, *lobos*, the lower part of the ear), a marginal division of a leaf or other similar structure.
- Loculicidal** (Latin *loculus*, a little place ; *cedo*, I cut), dehiscing down the dorsal suture and thus into the loculus of a capsule.
- Loculus**, a chamber of an anther or an ovary.
- Lomentaceous**, with transverse constrictions and sometimes transverse partitions and dehiscence, applied both to siliques, as in the Radishes, and to *Leguminosæ*, such as *Cassia* and *Hippocrepis*.
- Lyrate**, lyre-shaped, *i.e.* with the terminal leaflet in a pinnate leaf, or the terminal lobe in a pinnatifid one, larger than the rest.
- Macroscopic** (Greek *μακρός*, *makros*, long ; *σκοπέω*, *skopeo*, I see), seen with the naked eye, as opposed to microscopic.
- Male flower**, one containing stamens but not carpels.
- Marcrescent** (Latin *marcescens*, withering), persisting in a withered condition, as is the calyx in the Apple and Gooseberry.
- Maritime**, growing near the sea.
- Massula** (Latin, a little mass), a group of coherent pollen-grains, the produce of one mother-cell, in the pollinia of Orchids.
- Mature**, full-grown, ripe, ready for its function, used of anthers ready to burst, stigmas receptively sticky, ripe fruits, seeds, etc.
- Median plane**, in floral symmetry, the plane passing through the axis and bract from the back to the front of the flower, hence also termed the antero-posterior plane.
- Member**, a part of a plant considered with reference to its structural origin or morphological type.

GLOSSARY

- Mericaip** (Greek μέρος, *meros*, a part; καρπός, *karpos*, fruit), a portion of a fruit, either a carpel, as in *Umbelliferae*, or a half-carpel, as in *Labiatae*, which separates, generally as a one-seeded and not further dehiscent body, when the fruit is ripe.
- Merismatic tissue** (Greek μέρισμα, *merisma*, division), growing tissue, cambium; tissue in which the cells are capable of cell-division.
- Meristem**, merismatic tissue.
- Mesocarp** (Greek μέσος, *mesos*, middle; καρπός, *karpos*, fruit), the middle layer of the pericarp, e.g. the flesh in a stone-fruit.
- Mesophyll** (Greek μέσος, *mesos*, middle; φύλλον, *phullon*, a leaf), the cellular tissue in the interior of a leaf, between its upper and under epidermis.
- Mesophyte** (Greek μέσος, *mesos*, middle; φυτόν, *phuton*, a plant), a plant of average constitution not specially modified for drought or moisture.
- Metabolism** (Greek μεταβολή, *metabole*, change), the sum of the chemical changes of protoplasm.
- Micromillimetre**, the thousandth part of a millimetre, represented by the sign μ .
- Micropyle** (Greek μικρός, *mikros*, small; πύλη, *pule*, a gate), the opening left at the apex of the ovule in the formation of its coats by which the pollen-tube generally penetrates to the nucellus. It persists in the coats of the seed.
- Midrib**, the central, principal vein in a leaf.
- Mixed inflorescence**, one in which the primary branching is cymose and the secondary racemose, or *vice versa*.
- Monadelphous** (Greek μόνος, *monos*, one; ἀδελφός, *adelphos*, a brother), with the stamens united by their filaments into a tube, as in *Malva*, *Ulex*, etc.
- Monandrous** (Greek μόνος, *monos*, one; ἀνδρὸς, *andros*, of a man), with one stamen, as in *Arum*, *Euphorbia*, etc.
- Moniliform** (Latin *monile*, a necklace), a structure (hair or root) resembling a string of round beads.
- Monocarpellary** (Greek μόνος, *monos*, one; καρπός, *karpos*, fruit), made up of one carpel, as are the achene, drupe, follicle, and legume.
- Monocarpic**, producing only one crop of fruit during life, as do annuals, biennials, and such perennials as *Agave*.
- Monochlamydeous** (Greek μόνος, *monos*, one; χλαμὺς, *chlamus*, a cloak), with a perianth of one whorl.
- Monocotyledon** (Greek μόνος, *monos*, one; κοτυληδών, *kotyledon*, a seed-leaf), a plant with only one cotyledon.
- Monocyclic** (Greek μόνος, *monos*, one; κύκλος, *kuklos*, a circle), in one whorl.
- Monœcious** (Greek μόνος, *monos*, one; οἶκος, *oikos*, a house), having stamens and carpels in different flowers but on the same plant, as in Oak, *Hazel*, etc.
- Monogynous** (Greek μόνος, *monos*, one; γυνή, *gune*, a woman), having one carpel.
- Monopodial** (Greek μόνος, *monos*, one; ποδός, *podos*, of a foot), having one main axis; racemose.
- Monospermous** (Greek μόνος, *monos*, one; σπέρμα, *sperma*, a seed), one-seeded.
- Monosymmetric** (Greek μόνος, *monos*, one; σύμμετρος, *summetros*, symmetrical), in floral symmetry, capable of symmetrical division in one plane only; zygomorphic, as in the papilionaceous flower.
- Monotypic** (Greek μόνος, *monos*, one; τύπος, *typos*, a type), including only one species.
- Monstrosity** (Latin *monstrum*, a monster), an abnormality.
- Morphology** (Greek μορφή, *morphe*, form; λόγος, *logos*, science), the science of form.
- Mucilage**, an absorbent, gelatinous, soluble carbo-hydrate.
- Mucronate** (Latin *mucro*, a sharp point), ending in an abrupt point.

GLOSSARY

- Multijugate** (Latin *multus*, many; *jugum*, a yoke), with many pairs of leaflets, e.g. the pinnate leaves of *Mimosa*.
- Multilocular** (Latin *multus*, many; *loculus*, a chamber), many-chambered.
- Mutation** (Latin *mutatio*, a change), a considerable variation which, according to De Vries, is the starting-point of a new species.
- Mutualism**, the symbiosis or living together of two organisms for their mutual benefit.
- Mycelium** (Greek *μύκης*, *mukes*, a mushroom), the thread-like hyphæ, or "spawn," of a fungus.
- Mycorrhiza** (Greek *μύκης*, *mukes*, a mushroom; *ρίζα*, *rhiza*, a root), a fungus-mycelium living symbiotically on the roots of higher plants, such as saprophytes, *Cupulifera*, etc.
- Nanism** (Greek *νάνος*, *nanos*, a dwarf), becoming dwarfed.
- Napiform** (Latin *napus*, a turnip), turnip-shaped.
- Naturalised**, alien but so established as to reproduce itself regularly by seed.
- Natural System**, a classification of plants which endeavours by the consideration of the sum of their structural characters to represent their real affinities or genetic relationships.
- Nectar** (Greek *νέκταρ*, *nektar*, the drink of the gods), the saccharine secretion which is the main constituent of honey.
- Nectary**, any part which secretes, excretes, or stores honey; but more strictly confined to the actual thin-walled secreting organs. These may belong to carpel, stamen, petal, or floral receptacle, or be extra-floral, as on the petioles of *Drupacea*.
- Nerve**, sometimes used for the "ribs," "veins," or vascular bundles of the leaf.
- Net-veined**, with veins forming a network of meshes not regularly quadrilateral.
- Neuter**, without stamens or carpels, as are the outer flowers in the Guelder-rose (*Viburnum Opulus* Linné) and the outer florets in the Cornflower (*Centaurea Cyanus* Linné).
- Node** (Latin *nodus*, a knot), the part of a stem where the leaves arise, which often has a special structure, as in Grasses where it alone is solid, and in *Polygonaceæ* and *Caryophyllaceæ*, in which it is swollen.
- Nodulose** (*Nodosus*, Latin diminutive adjective from *nodus*), bearing rounded swellings, such as the adventitious roots of the Dropwort (*Spiræa Filipendula* Linné).
- Nucellus** (Latin diminutive from *nucleus*), the body of the ovule, apart from the coats which may grow up and invest it; also known as the *tercine*.
- Nut** (Latin *nux*, a nut), an indehiscent, one-seeded fruit with a hard pericarp.
- Nutation** (Latin *nutatio*, nodding), the nodding movement of the apex of growing organs.
- Nyctitropic** (Greek *νυκτός*, *nyktos*, of night; *τροπή*, *trope*, turning), assuming a distinct position (mainly vertical) in darkness, as in the leaves of the Wood Sorrel.
- Obconic** (Latin *ob-*, reversedly; *conicus*, conical).
- Obcordate** (Latin *ob-*, reversedly; *cordatus*, heart-shaped), as are the leaflets of the Wood Sorrel.
- Oblanceolate** (Latin *ob-*, reversedly; *lanceolatus*, lance-shaped), as are the leaves of the Ribwort Plantain (*Plantago lanceolata* Linné).
- Oblique** (Latin *obliquus*, slanting), unequal at the base, as is the leaf of the Linden.
- Oblong**, not more than four times as long as broad and with parallel sides, as are the floating leaves of some Pond-weeds.
- Obovate** (Latin *ob-*, reversedly; *ovatus*, egg-shaped), as are the leaves of the Cowslip.
- Obtuse**, blunt, rounded.

GLOSSARY

- Ochrea** (Latin *ocrea*, a greave), a pair of stipules united by both margins so as to form a tube round the stem, as in *Polygonaceæ*.
- Octandrous** (Greek *ὀκτώ*, *okto*, eight; *ἄνδρως*, *andros*, of a man), with eight stamens.
- Æcology**, now generally spelt ecology.
- Officinal** (Latin *officinalis*, belonging to the shops), used medicinally.
- Offset**, a short axillary branch of one internode terminated by a bud, as in the House-leek.
- Oleoresin**, a solution of a resin in a volatile oil, such as turpentine.
- Ontogeny** (Greek *ὄντος*, *ontos*, of a being; *γενεά*, *genca*, generation), the history of the development of an individual.
- Oosphere** (Greek *ὠόν*, *oon*, an egg; *σφαῖρα*, *sphaîra*, a sphere), the unencysted germ, ovum, or egg-cell.
- Oospore** (Greek *ὠόν*, *oon*, an egg; *σπορά*, *spora*, a seed), the encysted egg-cell.
- Operculate** (Latin *operculum*, a lid), opening by a lid, as in the anther of the Barberry and the fruit of the Pimpernels.
- Opposite**, of leaves when developed two at one node with an angular divergence of 180°; of floral organs when one is on the same radius as another; superposed.
- Optimum**, the best, *i.e.* most favourable, condition, whether of light, temperature, etc.
- Orbicular**, approximately circular or discoid.
- Order**, a group of Families constituting a division of a Sub-class.
- Ordinal character**, one distinctive of a Natural Order.
- Organ**, a part of a plant considered with reference to its function.
- Ornithophilous** (Greek *ὀρνίθος*, *ornithos*, of a bird; *φιλέω*, *phileo*, I love), pollinated by birds.
- Orthostichy** (Greek *ὀρθός*, *orthos*, straight; *στίχος*, *stichos*, a row), a vertical row of leaves.
- Osmose** (Greek *ὠσμὸς*, *osmos*, thrusting), the diffusion of liquids through membranes.
- Oval**, with curved sides, tapering equally in both directions.
- Ovary**, the cavity, formed by one or more carpels in Angiosperms, which contains the ovules.
- Ovate**, with curved sides but broader at the base.
- Ovule** (Latin *ovulum*, a little egg), the unfertilised seed.
- Ovuliferous**, bearing ovules.
- Palisade-tissue**, the hypoderm of the leaf consisting of closely-packed, vertically elongated, prismatic cells, rich in chlorophyll.
- Palmate**, made up of distinct leaflets radiating from the base like the fingers of the hand.
- Palmatifid**, palmately lobed.
- Panicle**, a much-branched inflorescence.
- Papilionaceous** (Latin *papilio*, a butterfly), butterfly-like, applied to the corolla of the *Papilionatæ*.
- Pappus** (Latin, thistle-down), the tuft of hairs on some fruits, as in many *Compositæ*.
- Parallel-veined**, with the principal veins approximately parallel, as in most Monocotyledonous leaves.
- Parasite**, a plant attached to, and nourished by, another.
- Parenchyma** (Greek *παρέγχυμα*, *parenchuma*, the tissue of the lungs), a tissue of cells approximately of equal length and breadth, or not more than four times as long as they are broad.
- Parietal** (Latin *paries*, a partition-wall), chiefly applied to the placentation when the ovules spring from the wall of the ovary.
- Paripinnate** (Latin *par*, equal; *pinna*, a feather), pinnate without a terminal leaflet, *i.e.* with an even number of leaflets.

GLOSSARY

- Pathological** (Greek *πάθος, pathos*, disease), resulting from disease.
- Pedate** (Latin *pedatus*, footed), used of compound leaves, the principal veins of which form two unilaterally cymose branchings on either side of the midrib, as in the frond of *Adiantum pedatum*.
- Pedatifid**, pedately lobed, as are the leaves of *Helleborus*.
- Pedicel** (Latin *pes, pedis*, a foot), a little stalk; the stalk of an individual flower.
- Peduncle**, with the same etymology, is used for the main stalk of an inflorescence.
- Pedunculate**, stalked.
- Pellucid**, transparent.
- Peloria** (Greek *πελώριος, pelorios*, monstrous), a polysymmetric variation of a normally monosymmetric flower, as in the Toad-flax (*Linaria vulgaris* Linné).
- Peltate** (Latin *pelta*, a shield), with the auricles united so that the leaf appears orbicular and the petiole appears as attached in the middle of the under surface, as in the Pennyworts.
- Pentamerous** (Greek *πέντε, pente*, five; *μέρος, meros*, a part), with five parts in each whorl.
- Pentandrous** (Greek *πέντε, pente*, five; *ἀνδρὸς, andros*, of a man), with five stamens.
- Perennate** (Latin *perenno*, I endure), to last through the unfavourable season.
- Perennial** (Latin *perennis*, lasting), lasting several years.
- Perfect**, containing both stamens and carpels.
- Perfoliate** (Latin *per*, through; *folium*, a leaf), applied to sessile leaves with auricles united round the stem, so that the latter appears to grow through the leaf.
- Perianth** (Greek *περὶ, peri*, around; *ἄνθος, anthos*, a flower), the floral envelopes.
- Pericarp** (Greek *περὶ, peri*, around; *καρπὸς, karpos*, fruit), the wall of the fertilised ovary, or other structures enclosing the seeds.
- Periderm** (Greek *περὶ, peri*, around; *δέρμα, derma*, skin), the secondary cortex or corky bark.
- Perigynous** (Greek *περὶ, peri*, around; *γυνή, gune*, a woman), applied to petals and stamens inserted round, but not under, the ovary.
- Perisperm** (Greek *περὶ, peri*, around; *σπέρμα, sperma*, seed), the food-reserve or albumen around the embryo-sac.
- Permanent tissue**, tissue which has ceased to grow.
- Persistent**, remaining on, as are the leaves of evergreens, the marcescent calyx, etc.
- Personate** (Latin *persona*, a mask), mask-like, applied to such bilabiate corollas as that of *Linaria* or *Antirrhinum*.
- Perulæ** (Latin *perula*, a little wallet), the bud-scales or other parts thrown off in spring or summer.
- Petal** (Greek *πέταλον, petalon*, a floral leaf), one of the leaves of the corolla.
- Petalody**, metamorphosis into petals.
- Petaloid**, petal-like, *i.e.* of delicate texture and some colour other than green.
- Petiole** (Latin *petiolus*, a little foot), the foot-stalk of the leaf.
- Petiolule**, a diminutive of petiole, the stalk of a leaflet.
- Phanerogam** (Greek *φανερὸς, phaneros*, manifest; *γάμος, gamos*, marriage), a plant having a distinct flower; a seed-bearing plant or Spermatophyte.
- Phellogen** (Greek *φελλὸς, phellos*, cork; *γεννάω, gennao*, I produce), the cork-cambium or growing layer producing the periderm.
- Phenology** (Greek *φαίνω, phaino*, I appear; *λόγος, logos*, science), the science of periodic phenomena, such as leafing, flowering, etc.

GLOSSARY

- Phloem** (Greek φλοιός, *phloios*, bark), the bast portion of a vascular bundle.
- Phylloclade** (Greek φύλλον, *phullon*, a leaf; κλάδος, *klados*, a branch), a flattened leaf-like branch, as in *Ruscus*, also termed a cladode.
- Phyllode** (Greek φύλλον, *phullon*, a leaf), a flattened petiole without a blade and performing all the functions of a leaf, as in *Lathyrus Nissolia* Linné, the Crimson Grass Vetchling.
- Phyllody**, the metamorphosis of floral leaves into green foliage-leaves.
- Phyllotaxis** (Greek φύλλον, *phullon*, a leaf; τάξις, *taxis*, arrangement), the relative positions of the leaves on a shoot.
- Phylogeny** (Greek φύλον, *phulon*, a tribe; γενεά, *genea*, generation), the succession of forms genetically or ancestrally related.
- Physiology** (Greek φύσις, *phusis*, nature; λόγος, *logos*, science), the science of function.
- Phytogeography** (Greek φυτόν, *phuton*, a plant; γῆ, *ge*, the earth; γραφή, *graphie*, writing), the science of plant distribution.
- Pileorhiza** (Greek πῖλεϋς, *pileus*, a cap; ῥίζα, *rhiza*, a root), the root-cap.
- Piliferous layer** (Latin *pilus*, a hair; *fero*, I bear), that portion of the young root, behind the apex, that bears the root-hairs.
- Pilose** (Latin *pilosus*, hairy).
- Pin-eyed**, long-styled, one of the forms of heterogonous flowers, more especially Primroses, in which the style and stigma are conspicuous in the eye or centre of the flower, like a pin's head.
- Pinna** (Latin *pinna*, a feather), a primary leaflet or division of a pinnate leaf.
- Pinnate**, with leaflets on either side of an elongated axis or rhachis, like the barbs of a feather.
- Pinnatifid**, pinnately-lobed, applied to simple leaves.
- Pinnatisect**, deeply pinnately-lobed.
- Pinnule**, a diminutive of pinna, one of the ultimate divisions of a bi-, or tri-, pinnate leaf.
- Pistil** (Latin *pistillum*, a pestle), a term we have avoided on account of its ambiguity, meaning either the gynæceum as a whole or one carpel in an apocarpous gynæceum.
- Pith**, the soft central tissue of the stem.
- Placenta** (Latin *placenta*, a flat cake), the soft spongy base upon which the ovules are attached, generally the margins of the carpellary leaves.
- Placentation**, the position of the placentas in the ovary.
- Pleiochasial** (Greek πλεῖον, *pleion*, more; χάσις, *chasis*, separation), with more than two branches of equal strength, applied to cymes.
- Plicate** (Latin *plicatus*, folded into plaits), folded into plaits like a fan, as are the leaves of the Sycamore and Beech.
- Plumule** (Latin *plumula*, a little feather), the primary shoot in the bud stage in the embryo.
- Pollen** (Latin *pollen*, fine flour), the microspores or minute dust-like male cells of Flowering Plants.
- Pollen-grain**, a single grain of pollen, generally unicellular.
- Pollen-sac**, the cavity, forming in an anther, in which the pollen originates.
- Pollen-tube**, the tube, protruded by a pollen-grain, which penetrates to the embryo-sac in fertilisation.
- Pollination**, the placing of pollen on the stigma, or in Gymnosperms in the micropyle, which may be effected by wind, water, insects, slugs, birds, or artificially.
- Pollinium**, the united pollen from one anther-lobe, as in Orchids.

GLOSSARY

- Polyadelphous** (Greek πολὺς, *polus*, many; ἀδελφός, *adelphos*, a brother), with stamens apparently united into three or more bundles, as in *Hypericum*.
- Polyandrous** (Greek πολὺς, *polus*, many; ἀνδρὸς, *andros*, of a man), having an indefinite number of stamens.
- Polycarpellary** (Greek πολὺς, *polus*, many; καρπός, *karpos*, fruit), of many carpels.
- Polycarpic** (Greek πολὺς, *polus*, many; καρπός, *karpos*, fruit), fruiting for several years in succession.
- Polygamous** (Greek πολὺς, *polus*, many; γάμος, *gamos*, marriage), having both perfect and imperfect flowers, *e.g.* the Ash.
- Polymorphic** (Greek πολὺς, *polus*, many; μορφή, *morphe*, form), variable.
- Polypetalous** (Greek πολὺς, *polus*, many; πέταλον, *petalon*, a petal), with distinct petals.
- Polyphyllous** (Greek πολὺς, *polus*, many; φύλλον, *phullon*, a leaf), with distinct perianth-leaves.
- Polysepalous**, with distinct sepals.
- Polyspermous** (Greek πολὺς, *polus*, many; σπέρμα, *sperma*, a seed), many-seeded.
- Polysymmetric** (Greek πολὺς, *polus*, many; σύμμετρος, *summetros*, symmetrical), capable of being divided symmetrically in more than two planes; actinomorphic.
- Pome** (Latin *pomum*, a fruit), an inferior fruit, generally syncarpous, and largely pseudocarpic, consisting of a fleshy adherent receptacular tube externally, while the carpels are mainly represented by a hard central core, as in the Apple.
- Pore**, any small aperture, as in the anthers of *Ericaceæ* and the capsules of Poppies.
- Pore-capsule**, a capsule dehiscing by pores, as in the Poppies.
- Porogamous** (Greek πόρος, *poros*, a pore; γάμος, *gamos*, marriage), fertilised by the pollen-tube entering by the micropyle, as opposed to chalazogamous.
- Posterior**, nearest the axis.
- Præmorse root** (Latin *præmorsus*, bitten off), a rhizome of which the older portion has died off leaving an abrupt end.
- Prepotent** (Latin *pre-*, before; *potens*, powerful), used by Darwin of pollen from a distinct variety, which germinates first or penetrates to the ovules in advance of that of the same flower.
- Prickle**, a pointed, and sometimes hooked, woody outgrowth of epidermal and hypodermal origin, as in the Rose.
- Primary root**, that formed by the direct elongation of the radicle of the embryo.
- Procumbent**, lying on the ground.
- Proliferous** (Latin *proles*, offspring; *fero*, I bear), used of leaves producing adventitious buds, as in *Bryophyllum*, and of flowers producing leaf-buds in the axils of their petals, as in *Cardamine pratensis* Linné, or elongating their main axis.
- Protandrous** (Greek πρῶτος, *protos*, first; ἀνδρὸς, *andros*, of a man), maturing the anthers before the stigmas; sometimes written proterandrous.
- Proteid** (named from the mythological Proteus, who had the power of constantly changing his shape, on account of their unstable character), an albuminoid substance.
- Proteolytic enzyme**, a ferment, such as pepsin, which can convert insoluble proteid into soluble peptone.
- Protogynous** (Greek πρῶτος, *protos*, first; γυνή, *gunc*, a woman), maturing the stigma before the anthers; sometimes written proterogynous.
- Protoplasm** (Greek πρῶτος, *protos*, first; πλάσμα, *plasma*, formed substance), the complex living substance in plants and animals, *e.g.* the contents of young cells, such as those of the cambium.
- Pruinose** (Latin *pruina*, hoar-frost, rime), with a waxy bloom.
- Psammophilous** (Greek ψάμμος, *psammos*, sands; φιλέω, *phileo*, I love), sand-loving.

GLOSSARY

- Pseudocarpic** (Greek *ψεύδος*, *pseudos*, falsehood; *καρπός*, *karpos*, fruit), having structures incorporated in the fruit other than the ovary.
- Pubescent** (Latin *pubescens*, becoming downy) downy.
- Pulvinus** (Latin, a cushion), variously used for the cushion-like bracket or swelling below the insertion of some leaves, and for the thin-celled turgid swelling at the base of the leaflets of some compound leaves, such as *Oxalis* and *Mimosa*.
- Pyxis** (Greek *πυξίς*, *pyxis*, a box), a capsule with transverse dehiscence, as in the Pimpernels (*Anagallis*), sometimes termed pyxidium.
- Quadrifid**, four-branched, as are the hairs in the bladders of the Bladderwort.
- Race**, a slight or varietal modification of a species that can be reproduced by seed.
- Raceme** (Latin *racemus*, a cluster), an indefinite inflorescence, *i.e.* one in which the terminal bud is the last to unfold; or, more strictly, such an inflorescence with stalked flowers.
- Racemose**, raceme-like, indefinite, acropetal, centripetal.
- Radical** (Latin *radicalis*, belonging to the root), used mostly of leaves which spring from an underground stem.
- Radicle** (Latin *radicula*, a little root), the primary embryonic root.
- Raphe** (Greek *ῥαφή*, *raphē*, a seam), the adherent funicle of an anatropous ovule; also spelt *rhaphe*.
- Raphides** (Greek *ῥαφίς*, *raphis*, a needle), needle-shaped crystals occurring in plants, often consisting of calcium-oxalate.
- Ray**, the outer florets of the capitulum of *Compositæ* when differing from the centre ones or disk.
- Receptacle, Common**, the extremity of a peduncle bearing the flowers, generally used of those expanded and bearing small crowded florets in the *Compositæ*.
- Receptacle, Floral**, the extremity of the axis or pedicel of a flower which gives rise to the sepals, petals, stamens, and carpels.
- Receptacular tube**, the tubular floral receptacle in perigynous and epigynous flowers, often called the calyx-tube.
- Receptive**, used of the stigma when viscid and thus capable of retaining pollen-grains.
- Reciprocal crossing**, when of two species either may be fertilised by the pollen of the other.
- Reflexed** (Latin *reflexus*, bent back).
- Regular**, an ambiguous term which we have avoided, often used of polysymmetric flowers, but sometimes also of monosymmetric ones.
- Reniform** (Latin *renes*, the kidneys), kidney-shaped, *i.e.* rounded but broader than the length.
- Replum** (Latin, door-frame), the persistent parietal placentas of the fruit of *Cruciferae*, though often incorrectly used to include the septum which connects them when the valves of the pericarp fall off.
- Reproduction, Vegetative**, the reproduction of a plant by runners, offsets, bulbils, or other detaching vegetative buds or axes, independently of seed-formation.
- Resin**, an oxidised hydrocarbon insoluble in water, but often dissolved in essential oil.
- Respiration**, the absorption or inhalation of oxygen and the exhalation of carbon-dioxide, a process common to all living beings, animals, or vegetables.
- Resupinate** (Latin *resupino*, I throw on his back), inverted, as are many flowers, such as those of Orchids and Violets, by a twisting of their stalks.
- Retinaculum** (Latin, a halter), the disk by which the pollinia of Orchids are attached.

GLOSSARY

- Reversed**, resupinate.
- Reversion**, harking back, reproducing the characteristics of an earlier condition or ancestral form.
- Revolute** (Latin *revolutus*, rolled back), applied to the margins of leaves, as in those of Heaths, Docks, etc.
- Rhachis** (Greek *ῥάχῃς*, *rhachis*, a backbone), often spelt less accurately *rachis*, the axis of an inflorescence or of a compound leaf.
- Rhipidium** (Greek *ῥιπίδιον*, *rhipidion*, a small fan), a heterodromous, uniplanar, unilateral cyme, as in *Iris*.
- Rhizome** (Greek *ρίζα*, *rhiza*, a root), a root-stock or more or less elongated underground stem, often fleshy, giving off adventitious rootlets, bearing scale-leaves and sending up annual shoots or radical leaves and scapes above ground.
- Rind**, the bark from the cambium outwards, all of which is stripped artificially from a tree in the process of rinding or barking.
- Ringent** (Latin *ringens*, gaping), applied to such bilabiate corollas as those of *Labiatae* or of Honeysuckle, in which the two main lobes gape apart.
- Root**, the descending, leafless, positively geotropic portion of the axis.
- Root, Adventitious**, a root not formed from the elongation or regular branching of the radicle, not acropetal and often given off by stems, leaves, etc.
- Root, Aerial**, a root given off in the air, as in the Ivy and in epiphytes.
- Root, Primary**, the radicle or its direct prolongation.
- Root-cap**, pileorhiza, the cap of dead cells protecting the growing-point of the root.
- Root-hairs**, unicellular outgrowths from the epidermis of young roots serving for the absorption of liquid food-material.
- Root-leaf**, a misnomer for a radical leaf, one springing from the base of the stem, close to the ground.
- Rootlet**, a small root or branch of the main root.
- Root-stock**, rhizome.
- Root-tubercles**, swellings on the roots, especially of *Leguminosae*, produced by the attack of symbiotic Bacteria.
- Rosaceous**, applied to any corolla which consists of five distinct equal petals with short claws, as in the Rose and Buttercup.
- Rosette**, the cluster of radical leaves so arranged as to overlap as little as possible, as in *Plantago*, *Primula*, etc.
- Rostellum** (Latin, a little beak), the abortive anterior lobe of the stigma of some Orchids forming a beak-like process.
- Rosulate** (Latin *rosula*, a little rose, a rosette), forming a rosette.
- Rotate** (Latin *rota*, a wheel), wheel-shaped, applied to a polysymmetric gamopetalous corolla with a short tube, as in *Anagallis arvensis* Linné, the Scarlet Pimpernel.
- Rotund**, rounded.
- Ruderal** (Latin *rudus*, rubbish), growing on rubbish-heaps.
- Rudimentary**, undeveloped, sometimes used for vestigial, *i.e.* degenerated.
- Ruminate**, applied to the endosperm of Ivy, Nutmeg, etc., in which the infolded coat of the seed resembles the stomach of a ruminant animal.
- Runcinate** (Latin *runcina*, a saw), with large teeth pointing downward towards the base, as in the leaf of the Dandelion.
- Runner**, a prostrate axillary shoot rooting at its nodes and giving rise to new plants, as in the Strawberry.
- Sac** (Latin *saccus*, a bag), a pouch or cavity.
- Saccate**, pouched.
- Sagittate** (Latin *sagitta*, an arrow), with triangular auricles directed towards the base of the leaf, as in the Arrow-head.

GLOSSARY

- Salver-shaped**, applied to the corolla, gamopetalous, polysymmetric, and with a long tube and the limb spreading at right angles to it, as in the Primrose.
- Samara** (Latin, the fruit of the Elm), a winged fruit, as in Ash, Maple, etc.
- Sapid** (Latin *sapidus*, savoury), of agreeable taste.
- Saprophyte** (Greek *σαπρὸς*, *sapros*, rotten; *φυτὸν*, *phuton*, a plant), a plant living upon dead organic matter, *i.e.* humus or leaf-mould.
- Sap-wood**, alburnum, the light-coloured young wood of tree-stems which still conveys the upward sap by its vessels.
- Saxicolous** (Latin *saxum*, a rock; *colo*, I inhabit), growing on rocks.
- Scabrous** (Latin *scaber*, rough).
- Scape** (Greek *σκάπος*, *skapos*, a stem), a peduncle rising directly from an underground stem with few or no leaves, as in *Anemone nemorosa* Linné, the Cowslip, Tulip, or Lily-of-the-valley.
- Scapigerous**, having a scape.
- Scattered**, applied to leaves, one at each node of the stem.
- Schizocarp** (Greek *σχίζω*, *schizo*, I split; *καρπός*, *karpos*, fruit), a partially dehiscent fruit, splitting into indehiscent mericarps, so as not to disclose the seeds, as in Mallows, *Umbelliferae*, *Labiatae*, etc.
- Scion**, the shoot used as a graft.
- Sciophilous** (Greek *σκιά*, *skia*, shade; *φιλέω*, *phileo*, I love), shade-loving.
- Sclerenchyma** (Greek *σκληρὸς*, *skleros*, hard; *ἔγχυμα*, *enchuma*, a tissue), a tissue of cells with thickened woody walls.
- Sclerophyllous** (Greek *σκληρὸς*, *skleros*, hard; *φύλλον*, *phullon*, a leaf), with rigid hard leaves, as in many Mediterranean and South African plants.
- Scorpioid** (Greek *σκορπίων*, *skorpion*, a scorpion; *εἶδος*, *eidos*, resemblance), an ambiguous term often applied to the coiled-up inflorescence in *Boraginaceae*.
- Secondary bast**, bast formed by the cambium-ring.
- Secondary root**, a branch of the primary root.
- Secondary wood**, wood formed by the cambium-ring.
- Secretion**, the separation of some substance—gaseous, liquid, or solid—out of the food or tissues of the plant, generally in special glands.
- Seed**, the fertilised ovule, one of the most distinctive structures of Flowering Plants.
- Seed-leaf**, cotyledon.
- Seedling**, a young plant produced from seed.
- Segregate** (Latin *segregatus*, separated), a form distinguished from a species of a more collective character, *e.g.* *Ranunculus floribundus* Babington as separated from the aggregate *R. aquatilis* Linné.
- Self-fertilisation**, pollination with pollen from the same flower.
- Self-sterile**, not susceptible of fertilisation by its own pollen.
- Seminiferous** (Latin *semen*, seed; *fero*, I bear), seed-bearing.
- Sensitive**, responsive to a stimulus, as are the leaves of *Mimosa pudica* Linné.
- Sepal**, one of the leaves of the calyx: they are generally green, broad-based, and pointed.
- Sepaloid**, resembling a sepal.
- Septate** (Latin *septum*, a partition), divided by partitions.
- Septicidal** (Latin *septum*, a partition; *caedo*, I cut), used of capsules when they dehisce by splitting the partition-walls between the chambers or along the ventral sutures.
- Septifragal** (Latin *septum*, a partition; *frango*, I break), used of capsules when in dehiscence the valves of the pericarp break away from the partition-walls.
- Septum** (Latin, a partition).

GLOSSARY

- Serrate** (Latin *serra*, a saw), with teeth pointing towards the apex, as in the leaf of the Linden.
- Sessile** (Latin *sessilis*, sitting), without a stalk.
- Seta** (Latin, a bristle).
- Setaceous**, bristle-like.
- Sexual System**, Linné's classification of plants, based on the number and position of the stamens and styles.
- Shoot**, a young stem and its leaves.
- Shrub**, a woody perennial of moderate height often branching low down, and thus not having a bole or single stem as a tree has.
- Silicle** (Latin *siliculus*, a diminutive of *siliqua*), a siliqua which is not much longer than its breadth, as in *Thlaspi*.
- Siliqua** (Latin), the long pod-like fruit of the *Cruciferae*, composed of two united carpels with parietal placentation and a longitudinal septum, and dehiscing by two valves which leave the replum with the seeds attached to it.
- Simple**, of one piece, not branched; as applied to leaves, with not more than one articulation; as applied to inflorescences, with only a single order of branching.
- Single**, as applied to flowers, with only one whorl of petals.
- Sinuate** (Latin *sinuatus*, curved), with a wavy margin, as in the leaf of the Common Oak.
- Sinus** (Latin, a curve), a re-entering angle, such as that between leaf-lobes or calyx-teeth.
- Social**, many individuals of the same species growing together—sometimes with other associated species less prominently represented.
- Spadix**, an inflorescence with a fleshy axis and sessile flowers, generally spicate, as in *Arum*.
- Spathe** (Greek *σπάθη*, *spathe*, a spatula), a large sheathing bract enclosing an inflorescence, sometimes membranous, as in *Narcissus*; or herbaceous, as in *Arum maculatum* Linné; or petaloid, as in the *Arum Lily*.
- Spathulate** (Latin *spatula*), spoon-shaped or obovate-attenuate, as are the leaves of the Daisy (*Bellis perennis* Linné).
- Species**, a distinct kind, including all the individuals which have the same constant characters.
- Specific character**, the character which serves to discriminate one particular species from others.
- Specific name**, the second word of the Latin binomial by which every plant is designated.
- Spermatophyte** (Greek *σπέρμα*, *sperma*, a seed; *φυτόν*, *phuton*, a plant), a seed-bearing plant, *i.e.* a Flowering Plant or Phanerogam.
- Sperm-cell**, a male cell; in Flowering Plants, a pollen-grain, or rather the terminal (reproductive) nucleus in the pollen-tube.
- Spicate**, resembling a spike.
- Spike** (Latin *spica*, an ear of corn), an indefinite inflorescence with an elongated axis and sessile flowers, as in *Orchis*.
- Spine**, a pointed woody structure, either terminating a branch, as in Blackthorn (*Prunus spinosa* Linné), or representing a leaf or stipule, as in Cacti and Gooseberry.
- Spongy mesophyll**, the loose tissue in the interior of leaves, with large intercellular spaces; the transpiration tissue.
- Sporophyll** (Greek *σπορά*, *spora*, a seed, *φύλλον*, *phullon*, a leaf), a spore-bearing leaf; in Flowering Plants, a stamen or a carpel.
- Spring-wood**, that portion of the annual ring in an exogenous stem which is produced at the beginning of the growing season and which has generally vessels of larger diameter.

GLOSSARY

- Spur**, a slender, hollow, tubular structure closed below, belonging generally to a sepal or a petal, and generally nectariferous, as in Larkspur, Columbine, Violet, etc.
- Spurred**, calcarate.
- Squamose** (Latin *squama*, a scale), scaly, as is the bulb of the Lily.
- Stamen** (Greek *στήμων*, *stemon*, a thread), a male sporophyll, consisting typically of a slender stalk, or filament, and the more essential anther containing the pollen, or microspores.
- Staminal leaf**, stamen.
- Staminate**, male, applied to a flower having stamens but not carpels.
- Staminode**, an abortive stamen not producing pollen.
- Standard**, the vexillum or posterior petal in a papilionaceous corolla.
- Starch**, an insoluble carbo-hydrate, occurring in granules and acting as a form of food-reserve.
- Station**, a locality for a plant.
- Stellate** (Latin *stella*, a star), radiating, as in some hairs.
- Stem**, the main ascending portion of the axis.
- Sterile** (Latin *sterilis*, barren), used generally of flowers which (being either staminate or neuter) do not produce seed.
- Stigma** (Greek *στίγμα*, *stigma*, a point), the receptive apex of the style, in the secretion from which the pollen-grain germinates.
- Stipitate** (Latin *stipes*, a stalk), having a stalk.
- Stipulate**, having stipules.
- Stipule** (Latin *stipula*, a straw), an appendage to the base of many leaves, generally paired.
- Stolon**, a slender horizontal branch, above or below ground.
- Stoloniferous**, with runners.
- Stomate** (Greek *στόμα*, *stoma*, a mouth), a stoma or breathing-pore, consisting of an aperture regulated by two guard-cells.
- Stone**, the endocarp of a drupe.
- Stone-fruit**, a drupe.
- Striate** (Latin *stria*, a furrow), marked with fine lines.
- Stylar canal**, the tube down the style.
- Style**, the tubular upward extension of the ovary.
- Sub-acute**, slightly pointed.
- Suberised** (Latin *suber*, cork), converted into cork.
- Subulate** (Latin *subula*, an awl), awl-shaped ; narrow, wider at the base and tapering to a point.
- Sucker**, a branch given off underground but rising above ground, as in Mints and Roses.
- Sulcate** (Latin *sulcus*, a furrow), furrowed.
- Superior calyx**, a calyx springing from the top of the ovary, the latter being adherent to the receptacular tube.
- Superior ovary**, one that is free from any lateral adhesion to the receptacular tube.
- Superposed** (Latin *superpositus*, placed over), vertically above, *e.g.* the stamens in the Primrose are superposed to the petals.
- Suppression**, the absolute non-development of some part normally present.
- Suture** (Latin *sutura*, a seam), a line of union between carpels, or a line down which they may split, which may be the midrib of a carpel (dorsal suture).
- Symbiosis** (Greek *σύν*, *sun*, with ; *βίωσις*, *biosis*, life), the close association of two or more dissimilar organisms ; known also as commensalism, consortism, or mutualism.
- Symmetrical** (Greek *συμμετρία*, *symmetria*, symmetry), capable of division into two similar halves.

GLOSSARY

- Sympetalæ** (Greek σὺν, *sun*, with ; πέταλον, *petalon*, a petal), gamopetalous plants.
- Sympodium** (Greek σὺν, *sun*, with ; πόδιον, *podion*, a small stalk), a pseudaxis or axis made up of a series of branches.
- Synacmic** (Greek σὺν, *sun*, with ; ἀκμή, *akme*, a point), homogamous ; maturing pollen and stigmas simultaneously.
- Syncarpous** (Greek σὺν, *sun*, with ; καρπός, *karpós*, fruit), with carpels united.
- Syngenesious** (Greek σὺν, *sun*, with ; γένεσις, *genesis*, beginning), having the anthers united, as in *Compositæ*.
- Synonym** (Greek σὺν, *sun*, with ; ὄνομα, *onoma*, a name), a name having precisely the same meaning as another.
- Synsepalous**, gamosepalous.
- Tap-root**, the primary root, especially when with few or no branches and tapering in form.
- Taxonomy** (Greek τάξις, *taxis*, order ; νόμος, *nomos*, law), classification.
- Tegmen** (Latin, a covering), the inner coat of a seed ; also known as endopleura.
- Tegumentary** (Latin *tegumentum*, a covering), relating to outer tissues.
- Teleology** (Greek τέλεος, *teleos*, of the end ; λόγος, *logos*, science), the theory of creation directed to definite purposes.
- Tendrill**, a slender, sensitive, climbing organ, either of stem or leaf origin.
- Tentacle**, a hair-like leaf-lobe, generally terminating in a gland and sensitive, as in *Drosera*.
- Teratology** (Greek τέρας, *teras*, of a prodigy ; λόγος, *logos*, science), the study of malformations.
- Terete** (Latin *teres*, rounded), circular in transverse section and tapering.
- Ternate** (Latin *terni*, by threes), with three leaflets arranged palmately, as in the Clovers.
- Terrestrial** (Latin *terrestris*, belonging to the earth), belonging to land, as opposed to water, or growing in the ground, as opposed to epiphytic.
- Testa**, the outer coat of the seed, generally leathery and often polished and coloured.
- Tetradynamous** (Greek τετράς, *tetras*, four ; δύναμις, *dunamis*, strength), with six stamens, of which four are longer than the others, as in *Crucifera*.
- Tetragonal** (Greek τετράς, *tetras*, four ; γωνία, *gonia*, an angle), four-angled.
- Tetramerous** (Greek τετράς, *tetras*, four ; μέρος, *meros*, a part), having the floral leaves in whorls of four each.
- Tetrandrous** (Greek τετράς, *tetras*, four ; ἀνδρὸς, *andros*, of a man), with four stamens.
- Thalamifloral** (Greek θάλαμος, *thalamos*, a bed room ; Latin *flos*, a flower), hypogynous ; with petals and stamens inserted on the receptacle below the gynæceum.
- Thalamus** (Greek θάλαμος, *thalamos*, a bed room), the floral receptacle, or extremity of the axis within the flower.
- Thorn**, a pointed woody branch.
- Throat**, the junction between the tube and the limb of a gamopetalous corolla.
- Thrum-eyed**, with stamens prominent, *i.e.* short-styled, applied in the dimorphically heterogonous flowers of Primroses.
- Tissue**, a mass of cells of common origin and similar form and character.
- Tomentose** (Latin *tomentum*, stuffing for cushions), with a dense covering of matted woolly hairs.
- Topiarian** (Latin *topiarius*, belonging to formal gardening, especially by clipping trees).
- Transverse**, across, from right to left, breadthwise, used of the dehiscence of some short rounded anthers, such as those of *Alchemilla* ; of that of some capsules, as that of *Anagallis* ; or, in floral symmetry, of the plane crossing the antero-posterior plane at right angles.

GLOSSARY

- Triadelphous** (Greek *τρεῖς*, *treis*, three ; *ἀδελφός*, *adelphos*, a brother), with three branched stamens, as in some species of *Hypericum*.
- Triandrous** (Greek *τρεῖς*, *treis*, three; *ἀνδρὸς*, *andros*, of a man), with three stamens.
- Tribe**, a sub-division of a Family.
- Trichome** (Greek *τρίχωμα*, *trichoma*, hairiness), a hair-like structure ; a modified epidermal cell.
- Trichotomy** (Greek *τρίχα*, *tricha*, threefold ; *τομή*, *tome*, cutting), branching into three.
- Trifoliate** (Latin *tres*, three ; *folium*, a leaf), with three leaflets.
- Trigynous** (Greek *τρεῖς*, *treis*, three ; *γυνή*, *gune*, a woman), with three styles.
- Trilobate** (Latin *tres*, three ; *lobus*, a lobe), three-lobed.
- Trilocular** (Latin *tres*, three ; *loculus*, a chamber), three-chambered.
- Trimerous** (Greek *τρεῖς*, *treis*, three ; *μέρος*, *meros*, a part), with parts in threes.
- Trimorphic** (Greek *τρεῖς*, *treis*, three ; *μορφή*, *morphe*, form), under three forms, as in the heterogony of *Lythrum*, in which there are long-styled, medium-styled, and short-styled flowers.
- Tripartite** (Latin *tres*, three ; *partitus*, cleft), deeply three-lobed.
- Tripinnate** (Latin *tres*, three ; *pinnatus*, feathered), thrice pinnate, *i.e.* with the pinnæ divided into secondary pinnæ and these into pinnules.
- Triquetrous** (Latin *triqueter*, three-angled).
- Tristichous** (Greek *τρεῖς*, *treis*, three ; *στίχος*, *stichos*, a row), in three vertical rows.
- Trivial**, common, applied to the specific names of plants.
- Tropophyte** (Greek *τροπή*, *trope*, a turning ; *φύτον*, *phuton*, a plant), a plant, such as our deciduous trees, which has xerophilous modifications during one season (winter) and hygrophilous ones during the other (summer).
- Truncate**, ending as if cut off abruptly.
- Tuber**, a short, thick underground branch with numerous buds or "eyes," but few roots, as in the Potato.
- Tubercle**, a diminutive of tuber, used either for the structures, mainly root, in terrestrial Orchids ; for the smaller bodies in the Lesser Celandine (*Ranunculus Ficaria* Linné) ; or for those produced by Bacteria on the roots of *Leguminosæ*.
- Tunicate** (Latin *tunicatus*, coated), covered with sheathing coats, as in the bulb of an Onion.
- Turbinate** (Latin *turbo*, a top), top-shaped.
- Turgor** (Latin, distension with juice).
- Umbel** (Latin *umbella*, a sunshade), an indefinite inflorescence with stalked flowers on an abbreviated main axis, so that all the pedicels radiate from one point, as in the Ivy.
- Umbel, Compound**, an umbel of umbels, the most frequent inflorescence in the *Umbellifera*.
- Umbellate**, umbel-like.
- Umbelliferous**, umbel-bearing.
- Umbellule**, one of the small or "partial" umbels of a compound umbel.
- Umbilicus**, the hollow in which the stalk of an apple is inserted.
- Unarmed**, without spines or prickles.
- Uncinate** (Latin *uncus*, a hook), hooked.
- Undershrub**, a low-growing plant with a woody stem, such as Heath.
- Unguiculate** (Latin *unguis*, a claw), with a narrow claw-like base, as in the petals of the Wallflower.
- Uniaxial** (Latin *unus*, one ; *axis*, an axle), with one main unbranched stem.
- Unicostate** (Latin *unus*, one ; *costa*, a rib), with one rib or vein.
- Unijugate** (Latin *unus*, one ; *jugum*, a yoke), with one pair of leaflets.
- Unilateral** (Latin *unus*, one ; *latus*, a side), developed on one side only.

GLOSSARY

- Unilocular** (Latin *unus* one; *loculus*, a chamber), one-chambered.
- Uniovulate**, with one ovule.
- Unisexual**, having stamens and carpels in distinct flowers.
- Urceolate** (Latin *urceolus*, a pitcher), applied to a calyx like that of the Bladder Campion (*Silene latifolia* Britten and Rendle), or such a corolla as is frequent among *Ericaceæ*, narrowed below and above but enlarging midway.
- Urticating** (Latin *urtica*, a nettle), stinging.
- Vallecula** (Latin diminutive from *vallis*, a valley), the groove between two ridges on the fruit of the *Umbellifera*.
- Valvate** (Latin *valva*, a swing-door), meeting without overlapping, as in the sepals of *Clematis* or *Fuchsia* in the bud.
- Valve**, one of the segments into which a dehiscent capsule splits.
- Variable**, occurring in many slightly differing forms.
- Variation**, a slight departure from the type.
- Variegated**, particoloured.
- Variety**, a more or less marked departure from the type of a species, less individual than a variation and often true to seed.
- Vascular** (Latin *vasculum*, a little vessel), having vessels, a distinctive name for all plants above the grade of Mosses.
- Vascular bundle**, a group of vessels, such as the veins in a leaf.
- Vegetative** (Latin *vegetus*, vigorous), connected with growth, often used, in contradistinction to reproductive, for organs or processes concerned mainly with individual growth or development.
- Vegetative Reproduction**, multiplication by suckers, bulbils, runners, etc., without seed-formation.
- Vein**, a rib, nerve, or vascular bundle in a leaf.
- Venation** (Latin *vena*, a vein), the arrangement of the veins in a leaf.
- Ventral** (Latin *venter*, the belly), anterior or inner, as opposed to dorsal, applied to the upper surface of ordinary horizontal or dorsiventral leaves, and to the sutures of a fruit nearest the axis, representing the margins of the carpellary leaves along which the seeds are commonly attached and along which alone dehiscence occurs in the follicle, as in the *Columbine*.
- Vernation** (Latin *ver*, spring), the method of folding of foliage-leaves in the bud.
- Versatile** (Latin *versatilis*, movable), turning freely on the apex of the filament, applied to anthers, such as those of most *Liliaceæ*.
- Verticil** (Latin *verticillus*, a spindle), a whorl.
- Verticillaster**, a false or apparent whorl of flowers produced by two sessile axillary cymes or glomerules in the axils of two opposite leaves, as in *Labiata*.
- Verticillate**, whorled.
- Vessel**, a row of cells fused by the absorption of their transverse partition-walls into a tubular duct.
- Vestigial** (Latin *vestigium*, a foot-step), surviving from some ancestral form, though, perhaps, no longer of use.
- Vexillary æstivation**, the papilionaceous arrangement of the floral organs in *Papilionata*.
- Vexillum** (Latin, a standard), the standard or large upright petal in *Papilionata*.
- Villous** (Latin *villus*, a long hair), with long weak hairs.
- Virescent** (Latin *virescens*, turning green).
- Viscid** (Latin *viscidus*, sticky).
- Viscous**, viscid.
- Vitta** (Latin, a fillet), the elongated tubular cavities in the pericarp of the *Umbellifera* containing essential oil.
- Water-stoma**, a large stoma-like gland excreting water.
- Water-storing tissue**, a tissue of large thin-walled cells developed in succulent xerophytes.

GLOSSARY

Whorl, a circle of organs round an axis, used especially of floral leaves as distinguished from spiral arrangements.

Whorled, cyclic, not spirally arranged.

Wild, not introduced by man, nor cultivated by him in the area in question.

Wilted, limp, flaccid, from excessive transpiration.

Xerophilous (Greek ξηρὸς, *xeros*, dry; φιλέω, *phileo*, I love), growing in arid situations.

Xerophyte (Greek ξηρὸς, *xeros*, dry; φυτὸν, *phuton*, a plant), a plant adapted to a reduced water supply.

Xylem (Greek ξύλον, *xulon*, wood), the inner wood - portion of a vascular bundle.

Zodiophilous (Greek ζώδιον, *zodion*, a little animal; φιλέω, *phileo*, I love), pollinated by small animals; sometimes spelt zoidiophilous.

Zoochore (Greek ζῶον, *zoon*, an animal; χωρὶς, *choris*, apart), a plant dispersed by animal agency.

Zoophilous (Greek ζῶον, *zoon*, an animal; φιλέω, *phileo*, I love), pollinated by animals.

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